SCIENTIFIC AMERICAN

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IRREGULARITIES IN THE CONSTRUCTION OF THE NEW YORK AQUEDUCT.—[See page 6.]

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 658,

For the Week Ending July 7, 1888.

Price 10 cents. For sale by all newsdealers.

A DISSOLVING ISLAND.

The Dominion steamer Alert recently left Halifax, N. S., with men and material for the erection of a lighthouse, for the third time, on the west end of Sable Island.

The rapid disappearance of this remarkable island is one of the present marvels of the North Atlantic. Year by year it lessens in extent, threatening soon to be submerged, and its existence at no distant day promises to be as great a mystery as the location of the mythical Atlantis.

Mr. S. D. Macdonald, F.G.S., who, in the interest of science, has made himself personally acquainted with this island, making a special study of the various transformations it has undergone from its earliest history, and who has just returned, after noting its most recent changes, called the attention of Admiral Lyons to the rather startling fact that not only has the northwest submerged bar traveled in pace with the retreating west end, but has also changed its direction, swerving eastward, and now bears almost due north, or at right angle to the island proper, as shown by its 17 miles of breakers in bad weather. This renders the chart of the North Atlantic, reissued during the present year, widely inaccurate, showing an error of from 7 to 10 miles in the longitude of the outer portion of this bar. Further, this chart gives height of sand hills as 150 feet, when in no instance could Mr. Macdonald find a hummock having an elevation of 80 feet. This also misleads as to distance.

The lighthouse will not be completed probably before August next. In mean time navigation becomes exceedingly dangerous from the fact of those changes and errors of the chart being unknown to mariners.

Within a comparatively short space of time, dating back but a few years previous to the founding of the life saving station, it has decreased in length from 40 miles to 19½, in breadth from 2¼ miles to less than 1 mile.

The future of this island is everything but cheering to the navigator, and should those destructive forces now in operation continue, in not a very remote period the sea will claim this island as its own.

The site for the new lighthouse is well chosen on a broader portion of the island, as near as possible under the circumstances to that ever dangerous northwest bar whose presence has been so terribly felt, and in whose secret lies the fate of many a missing mariner.

In our SUPPLEMENT, No. 436, we gave an interesting paper, read some time ago by Mr. Macdonald before the Institute of Natural Science, Halifax, in which various facts relating to the condition of Sable Island, and the progress of its submergence, were set forth.

POSITION OF THE PLANETS IN JULY.

VENUS

is morning star until the 11th, and then becomes evening star. She is conspicuous, not by her presence, but by her absence from the sky in the month of July. She is in superior conjunction with the sun on the 11th at 2 h. P. M. She then passes beyond the sun, changing from his western to his eastern side, and is at her greatest distance from the earth. Her lesser light is entirely hidden in the sunbeams during the entire month. This beautiful star is in conjunction with Mercury on the 8th, when morning star, and in close conjunction with Saturn on the 27th, when evening star. Venus rises on the 1st at 4 h. 18 m. A. M. On the 31st she sets at 7 h. 33 m. P. M. Her diameter on the 1st is 9".8, and she is in the constellation Gemini.

JUPITER

is evening star. He is a brilliant object in the southeastern sky in the early evening, and reaches the meridian at 9 h. P. M. on the 1st. He changes his course on the 24th, moving eastward and approaching the red star Antares, which is southeast of the planet. Jupiter sets on the 1st at 1 h. 44 m. A. M. On the 31st he sets at 11 h. 44 m. P. M. His diameter on the 1st is 41".2, and he is in the constellation Scorpio.

MARS

is evening star. He is in quadrature with the sun on the 22d, and is, at that time, on the meridian at sunset. He will be in fine position for observation during the whole month. He is in conjunction with Spica on the 3d, passing 1° 32' north of the bright star, and is also approaching Jupiter. Mars sets on the 1st at 11 h. 59 m. P. M. On the 31st he sets at 10 h. 33 m. P. M. His diameter on the 1st is 10".6, and he is in the constellation Virgo.

URANUS

is evening star. He is in quadrature with the sun on the 4th, at 4 h. P. M. Uranus sets on the 1st at 11 h. 48 m. P. M. On the 31st he sets at 9 h. 51 m. P. M. His diameter on the 1st is 3".6, and he is in the constellation Virgo.

MERCURY

is evening star until the 12th, and after that time morning star. He is in inferior conjunction with the sun on the 8th, at noonday, and reaches his greatest western elongation on the 29th, at 2 h. A. M., when he is 19° 31' west of the sun, and favorably situated for being seen by sharp sighted observers. Mercury sets on the 1st at 7 h. 55 m. P. M. On the 31st he rises at 3 h. 27 m. A. M. The diameter of Mercury on the 1st is 11".4, and he is in the constellation Gemini.

SATURN

is evening star. He is of little account during the month, for his period of visibility has closed, and he is hidden in the sun's rays. Saturn sets on the 1st at 9 h. 3 m. P. M. On the 31st he sets at 7 h. 17 m. P. M. His diameter on the 1st is 15".6, and he is in the constellation Cancer.

NEPTUNE

is morning star. He rises on the 1st at 1 h. 59 m. A. M. On the 31st he rises at 0 h. 4 m. A. M. His diameter on the 1st is 2".5, and he is in the constellation Taurus.

Venus, Saturn, Uranus, Mars, and Jupiter are evening stars at the close of the month. Mercury and Neptune are morning stars.

NEW YORK HARBOR.

Two bills of much importance have recently passed Congress: One preventing the dumping of ashes and refuse within the limits of the port; the other laying down anchorage limits for every class of vessel, so that the fullest room may be left for passing traffic.

Thirty thousand dollars has been appropriated to carry the former into effect under the management of a naval officer, to be known as a supervisor, to be directly responsible to the U. S. Engineer Department, and a similar amount will probably be approved for anchorage purposes.

Each of these departments to be effectual will require ceaseless vigilance, stern uprightness, and business methods of the highest order.

Unscrupulous contractors and local politicians have for many years been defying the Pilot Commissioners and all others having the welfare of this national harbor at heart.

Fortunately, the bills are so framed that ample power is given to whoever may be placed in charge to enforce them to the fullest.

The Secretary of the Navy will doubtless detail officers fully able to suppress the jobbery and vandalism now so rife. These gentlemen with able assistants, a proper corps of harbor and shore inspectors, and a flotilla of swift cheap launches, will strike terror on all wrong-doers.

Their movements should be ubiquitous—here and everywhere, at all hours of the day and night.

No scow should be loaded without a permit, nor leave the dock without notifying the supervisor, and a sworn statement should be made as to time and place of loading and discharge.

The commissioner in charge of street cleaning should heartily co-operate.

Confiscation of the property and a heavy penalty should immediately follow disobedience of orders.

As regards anchorage, most accidents arise from want of established and enforced limits. At present, vessels spread themselves over the harbor. They drop their anchors with any length of chain that suits them, dragging if too short, and taking unnecessary room if too long. No harbor in the world is so destitute of common care and mooring appliances as the port of New York.

The duties needed to reform this state of affairs are essentially naval, have not and should not have any bearing on military knowledge or services, and for this reason it is to be hoped that the officers selected to fill these important posts may possess great activity and high nautical judgment, so that when questions bearing on the welfare of the port arise and come up for discussion, they may be able to speak wisely and authoritatively.

Telegraphing by the Clouds.

Admiral Sir W. Hunt Grubbe has recently made some interesting experiments at the Cape of Good Hope on the sending of signals by means of the rays of an arc lamp reflected by the clouds.

The luminous fascicle from a 100,000 candle arc lamp was directed against the clouds by means of a reflector, and interrupted according to the heliographic code. The dispatch could be read with ease at Cape Town.

Other experiments were made by a vessel of the navy sent out to sea, and the signals could be read from a distance of 50 miles. This method affords a possibility of sending signals at sea, and might prove useful in favorable weather for ships in danger.—*La Lumiere Electrique.*

LONDON, June 23.—The patents of an American invention, known as the Cyclone Pulverizer, were purchased here to-day for France, Italy, and Belgium for £40,000. The venders were Erastus Wiman, of New York, and associates, and the purchaser was Gustave Drolet, representing a French syndicate.—*Dispatch in the N. Y. World.*

Speed of Railway Trains.

What is the fastest railway time ever made? is a question much easier asked than answered, and the answer, if it could be definitely given, aids but little in arriving at the speed practically attainable in regular railway business. Extremely high rates of speed, perhaps equaling, if not surpassing, any that have been attained since, were achieved in the very earliest days of railroading. In 1841, Mr. I. K. Brunel, the constructing engineer of the Great Western Railway, of England, and who afterward built the Great Eastern, advertised to run from Bristol to London in two hours, which was at the rate of sixty miles an hour, and Mr. R. Dymond, F.S.A., has stated in *Notes and Queries* that in 1846 he traveled with Brunel over the South Devonshire Railroad at a speed of seventy miles an hour. The first specially fast express train ever run was in 1846, on the Great Western road, under the management of Brunel, and was known as the "Flying Dutchman," which name it has since retained. It made the distance of 193 miles from London to Exeter in four and a half hours, with five stops, the full running speed of the train between stations being at the rate of 63·9 miles per hour. The schedule time of the same train, forty years later, is sixteen minutes short of the time then made, but less time is deducted for stops, and the full running speed is only 55·1 miles per hour. The best time ever reported for this train was May 11, 1848, in a run from London to Didcot, 53 miles in 47 minutes, when it is said that a speed of 76 miles per hour was attained for a portion of the distance, the weight of the engine and train being 240,000 pounds, while the weight of the engine and train as now regularly run, with eight cars, is 525,000 pounds. A recently published statement gives the schedule time of a regular train of the Great Northern Railway, of England, for 105¼ miles, at 53·6 miles per hour; and for "the Flying Scotchman," a regular train on the East Coast route, from London to Edinburgh, 392½ miles, the speed is 48 miles per hour, there being five stops and the total time being 8 h. 55 m. The fastest regular train on the Continent of Europe is said to be that between Bordeaux and Paris, on the Orleans road, the distance of 359 miles being made in 9 h. 6 m., with ten stops, and the full running speed being 43¾ miles per hour.

Probably one of the fastest trains ever run in this country was a special on the West Shore line, from Buffalo to Jersey City, on July 9, 1885, making a distance of 422½ miles in 9 h. 23 m. On a section of 61 miles of this distance, made in 56 minutes, the speed is reported to have reached a rate of 71·6 miles per hour. The weight of the engine and train was 311,000 pounds. On the New York Central, the Sunday newspaper train has been run 440 miles from New York to Buffalo, at a speed of 45¼ miles per hour, making the total distance in 9 h. 30 m., and running from Syracuse to Rochester, 81 miles, in 85 minutes, or at the rate of 57 miles per hour, and numerous examples can be quoted of speeds about equaling this, it being nothing extraordinary for regular trains to attain a speed of 60 miles an hour and slightly over for short distances. One of the best authenticated tests of locomotive performance was a trial in 1885, over the Bound Brook route from Jersey City, where the weight of the engine and train was 370,000 pounds, and the trial was made in regular service. The tests were made by engineers who published full reports, which were also published in leading English papers, showing consumption of fuel and all details, the engine being built at the Baldwin Locomotive Works, and having coupled drivers only 68 in. in diameter. In this test it was shown that the slip of the driving wheels was practically nothing, and the indicator cards gave a speed as high as a mile in 46 seconds, or equal to 78·26 miles per hour.

The attainment of such exceptionally high speeds, however, for very short distances has but little of practical value; such apparent feats in railroading are really quite old, and are not to be compared in importance or in difficulty with what is now being accomplished every day by the "Limited" trains between New York and Chicago. The distance by the Pennsylvania road is 912 miles and by the New York Central it is 977 miles, and the time in each case is only 23 hours, with heavy trains making several stoppages. Considering distance, time, and quality of work, these trains are undoubtedly entitled to precedence in any proper comparison with the best fast trains operated by railroads anywhere else in the world.

Protection to Manufacturers and Bottlers.

The New York legislature at its last session so amended the law as to containers as to protect the owners of bottles, boxes, siphons, and kegs by prohibiting their use or sale by other parties. Hereafter, all traffic in containers is met with a heavy penalty, and junk dealers especially are prohibited from handling any of the articles having marks or devices branded, stamped, engraved, blown, or otherwise produced. The owners are required for their own safety to file a description of their trade marks and containers in the office of the county clerk and with the Secretary of State.

New Vestibule Trains.

The four "vestibule" trains on the Atchison, Topeka, and Santa Fe's new Chicago line are said to be the finest and most luxurious yet seen in the West, embodying many improvements on the famous original vestibule train. Each train consists of one baggage car, a mail car, a second class coach, two first class coaches, composite or parlor smoking coach, one dining car, and two sleeping coaches, or nine vestibule coaches in each train. The cars were built by the Pullman Palace Car Company, and are lit with the electric light and heated with steam from the engine. The sleeping cars, 60 ft. long, are furnished in Louis XV. design, with mahogany and English antique oak.

They are elaborately upholstered in peacock blue silk glace plush. The composite or parlor smoking car is in two apartments, the reading section containing a library, writing desk, etc., and is finished in silk glace plush and gold brown, with easy lounging chairs, sofas, ottomans, etc., as well as with movable wicker settees. The woodwork is of English antique oak in Moorish design and elaborately carved. The dining cars are finished in French antique oak, elaborately carved, and in addition to the other conveniences, contain inclosed sections for private parties, very elaborate buffet, and a wine room. No wood is exposed in the kitchen.

The first class coaches are finished in mahogany, with high back sofa seats, upholstered in maroon and old gold mohair plush. Each coach has gentlemen's toilet and ladies' toilet and dressing rooms. The second class coach is finished in native ash with Moorish designed ceilings, rattaned sofa seats, and closet and toilet rooms. The trucks have 42 in. steel-tired paper wheels. The entire length of each train will be about 600 ft.—the longest vestibule train ever seen in this or any other country. The electric lighting system comprises a small Brotherhood engine and dynamo, which is placed in the baggage car, occupying a space of about 3 ft. by 5 ft., and from which the wires are led through the train, thus charging the storage batteries that are carried under the cars. Each car is thus electrically independent of the others. The interior fittings are silver plated.

Improved Process of Tinning.

An improved process for coating metals with tin, by Borthel and Moller, of Hamburg, is said to possess the advantage of preventing, or at least delaying, oxidation. The process can be employed with special advantage for tinning cast iron cooking utensils, household and other implements of cast iron, as the employment of poisonous enamel is avoided and a much higher degree of polish attained. The process can also be employed for protecting architectural or other iron decorations from rusting by the coating of tin or other metal, without detriment to the sharpness of the form, as is the case with the customary oil or bronze paints. In order to produce a perfectly even coating of tin on cast iron, the same is first provided with a thin coating of chemically pure iron, regardless of the form of the casting. This coating is produced in galvanic manner in a bath composed as follows: 600 grammes of sulphate of iron, $FeSO_4$, are dissolved in 5 liters of water, to which we add a solution of about 2,400 grammes of carbonate of soda, Na_2CO_3, in 5 liters of water. The precipitate of ferro-carbonate ($FeCo_3$) resulting is dissolved in small quantities in so much concentrated sulphuric acid until the fluid has a green color. The bath is then rendered aqueous by adding about 20 liters water. Blue litmus paper dipped in the bath must assume a deep claret color, and red litmus paper remain unchanged.

The objects to be provided with a coating of chemically pure iron are placed in the bath opposite to the anode of cast or wrought iron or iron ore, and both parts connected to the corresponding poles of a dynamo machine, electric battery, or other appropriate source of electricity. In a very short time the objects placed in the bath are covered with a coating of iron, the thickness of which depends on the duration of the action of the bath or the strength of electric current. The coated objects are then well rinsed in clear water, dried, then painted with, or immersed in, a solution of ammonia in chloride of zinc or chloride of zinc alone, and then immersed in a vessel containing molten tin. The tin adheres with great tenacity to the prepared surface, and the surplus of tin can be readily removed by a brush or in other manner. If the object to be tinned is of such size, or so complicated in form, that it cannot be readily immersed in molten tin, it can be placed in a galvanic tin bath, which can be readily made in any desired size, and be provided with a layer of tin of desired thickness, which, after having been painted either with a solution of chloride of zinc or ammonia in chloride of zinc, can be heated to such a degree that the tin is equably melted on to the object.

In like manner objects cast or made of lead or other readily melting metal, which would lose their form by melting when immersed in molten tin, are, previous to tinning, provided with a coating of pure iron, and are then provided with a coating of tin in a galvanic bath, as mentioned above, without being subjected to heat for melting the layer of tin deposited on the same. With objects of wrought or rolled iron, or which do not require the before described treatment—*id est*, the production of a coating of chemically pure iron—it will be sufficient to carefully clean the same and paint them with a solution of ammonia in chloride of zinc or a concentrated solution of chloride of zinc. This tinning process combines the advantage of simple manipulation and the great durability of the coating with cheapness of manufacture, which is partially attained in the saving in tin.

Economy of High Pressure Steam Jackets.

According to the *Revue Industrielle*, M. P. Guzzi, an Italian engineer, has recently introduced a system of constructing steam engines in which the jacket is supplied with steam of a higher pressure than that used inside the cylinder. The high pressure steam is generated by a small boiler constructed on Perkins' system, which is placed inside the furnace of the main boiler. In this way steam is obtained at a pressure of about 220 pounds per square inch, with a corresponding temperature of about 390 degrees Fahr., and with this steam the jackets are supplied, and when condensed in these it drains back into the boiler. By this arrangement the initial condensation in the cylinder is materially reduced, with a corresponding improvement in the efficiency of the motor, as the following figures, taken from an engine when working as described above, and when working under normal conditions, show:

	Jacket using steam at a pressure of 176 lb. per sq. in.	Jacket working under normal conditions.
Date experiment	February 24, 1886.	February 20, 1886.
Duration of test	5 hours 18 minutes.	7 hours 11 minutes.
Mean effective pressure in main boiler	56·6 lb. per sq. in.	56·2 lb. per sq. in.
Mean indicated horse power	25·9	25·67
Consumption of water per indicated horse power per hour.	19·6 lb.	23·5 lb.

This engine has now been working for about eighteen months, but in other cases, to avoid the risk arising from high pressure steam, it has been proposed to substitute for the steam the vapor of linseed oil, which boils under atmospheric pressure at about 700 degrees Fahr.

Contagious Diseases.

Scarlet fever, a contagious disease producing a large annual mortality, is produced by a specific poison which emanates from the person of the patient, and can be caused by no other means, and this poison is remarkable for the tenacity with which it affixes itself to objects, which, if portable, may convey it long distances, and for its tenacity of life, which renders it difficult to destroy. Diphtheria, also a contagious disease, and largely fatal, may also arise from other causes than contagion, notably from fermenting filth, and requires, not only isolation, but cleanliness for its extinction. Typhoid fever and Asiatic cholera, while not directly communicable from person to person, are spread by the dejecta of their victims, which contaminate the water supply, and thus an efficient disinfection of these dejecta is a very desirable thing to accomplish. Small pox may be exterminated by vaccination, and this, I am happy to concede, is a fact on which the public requires less information than most others, albeit these are skeptics here. It is evident if the public knew how diseases arise and are disseminated, it would be prepared to more heartily and effectually second the endeavor of sanitarians to limit and subdue them. In proportion to its knowledge of sanitation would its zeal increase.—*G. A. Collamore, M.D.*

The Perekop Canal.

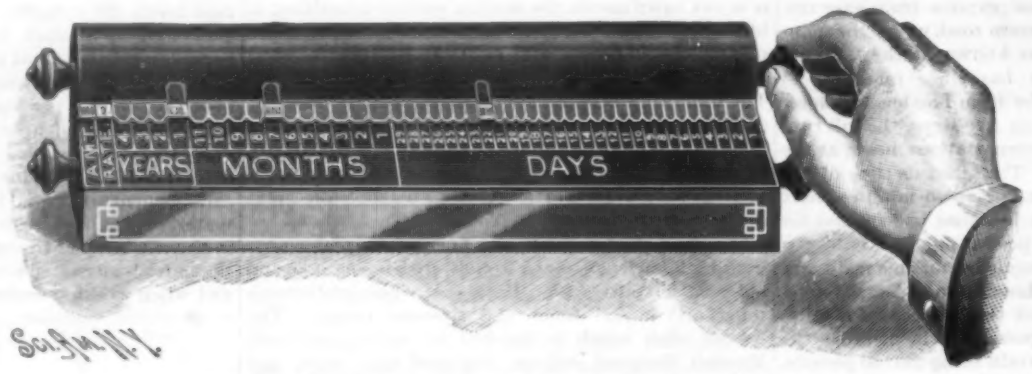
The Cronstadt *Messenger* gives the following details concerning the canal through the Perekop Isthmus in the Crimea: "The canal will traverse Gontchar and Sivasch from Perekop to Guenitchesk. It will be 111 versts or 74 miles in length. Its breadth will be 65 feet and its depth 12 feet. The works will be directed by Major-General Jilinsky and the French engineers Messrs. Essant and Carouzot. At both ends of the canal ports are to be established for coasters. The necessary funds (85,000,000 rubles) for the work are already appropriated. The Perekop canal will form the line of shortest communication between Guenitchesk and the ports of the northern coast of the Black Sea. At present Marioupol is 434 miles from Odessa. When the canal is opened, it will be only 295."

The Population of Paris.

The statistical bureau of the municipality of Paris has just issued the returns as to the population of the city and of the department of the Seine at the end of 1886. These returns put the total population of the department at 2,961,089, of whom 2,344,450 were resident in Paris itself. At the beginning of the century the total population of the Seine was only 631,585, so that it is now more than four times larger than it then was, increasing to 1,200,000 in 1840 and to 2,400,000 in 1876. It has, therefore, increased by about 600,000 in the last ten years.

AN INSTANTANEOUS INTEREST INDICATOR.

A machine by which the interest on any sum from $10,000 to $1, from ten years to one day, at any rate per cent, may be determined in thirty seconds, by simply turning a knob, is illustrated herewith, and has been patented by Mr. C. M. Dunham, of St. Joseph, Mo. An interest sheet is wound around the rollers inside the machine, which are rotated by the knobs at the side to stop at the given amount desired, and given rate per cent, as printed on the interest sheet, this portion then appearing in the open space on the left hand margin of the machine. Then the small metal tablets on the face and across the center are thrown up with the point of the pencil, for the time the interest is to be computed. This being done, the required interest is in plain view. By the use of this machine all of the mental and three-fourths of the physical labor is dispensed with. It is quicker than books or charts. It is safer than books or charts, because you cannot see any figures but those you wish to see. It keeps its own time. It does not get on the wrong line, or in the wrong column. It is indorsed by bankers and the business public generally. Parties who never used books or charts have ordered the machine. The machine is designed to be and is a labor saver, mental and physical, and is so constructed as to render it almost impossible to make errors in calculations. The machine is made of brass and nickel-plated, the letters and figures being sunk and filled with black, it being designed to be an ornament to any banker's or broker's desk, and one which is not likely to get lost or misplaced. It is 15 inches in length, 4 inches high, and 4 inches wide. In our illustration the device is shown as indicating the interest on $7,000 for 1 year, 7 months, and 22 days at 9 per cent, the amount and rate of interest appearing in spaces at the left hand margin, and the several sums of interest for the three periods—$630, $367.50, and $38.50—are exposed under the metal tablets across the center, at the points indicated by the proper figures below for the year, months, and days called for.



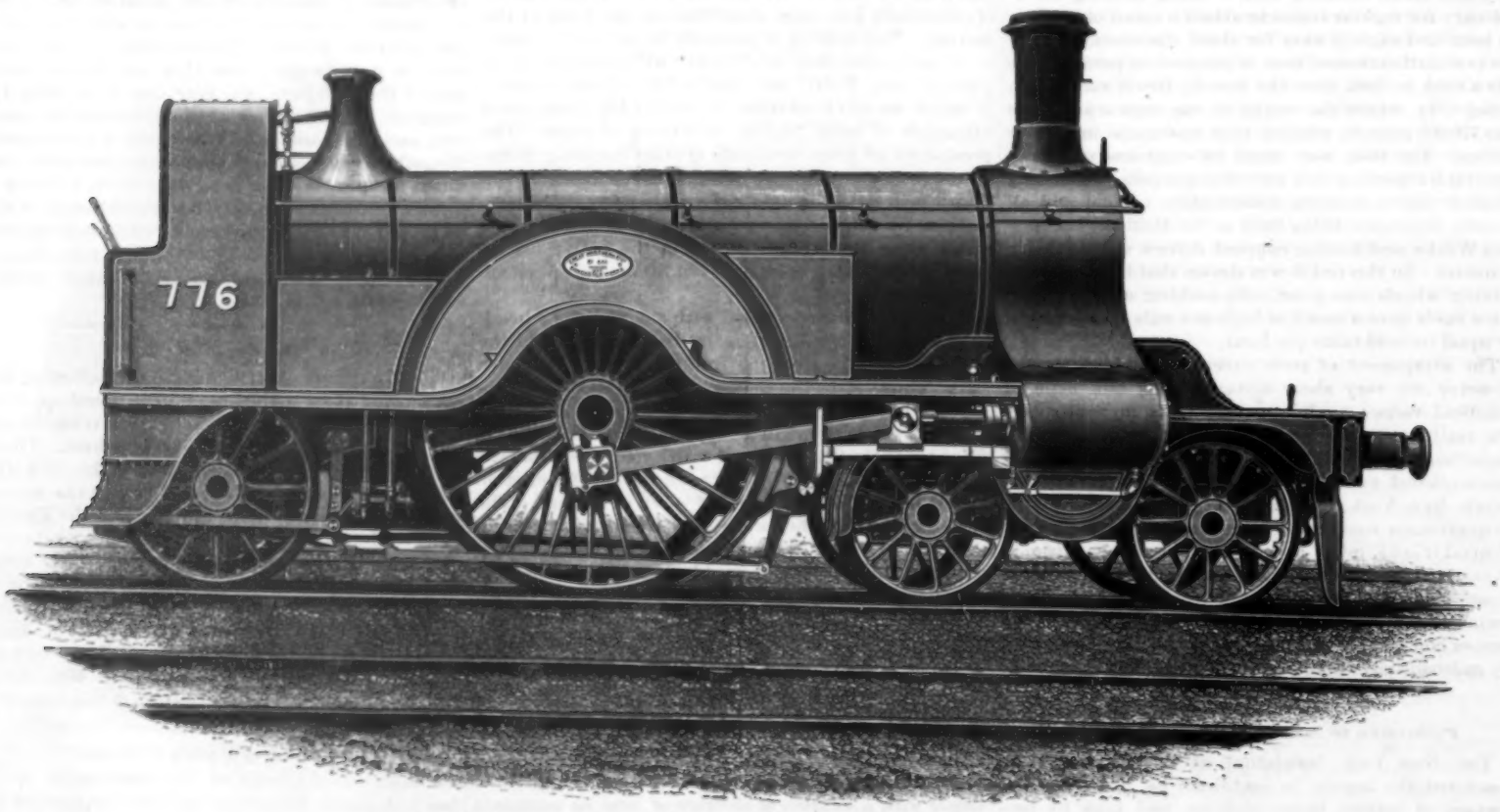
DUNHAM'S INSTANTANEOUS INTEREST INDICATOR.

EXPRESS ENGINE, GREAT NORTHERN RAILWAY.

We give an illustration of one of the newest express engines lately completed for the Great Northern Railway, England. It will be interesting to compare this machine with that of the new type of express engines of the New York, New Haven, and Hartford company, of which we publish an example this week. The American locomotive, it will be observed, is a much more powerful specimen of mechanism, and alongside of it No. 776 looks diminutive. The dimensions of the latter are as follows:

The cylinders are 18 in. diameter, 26 in. stroke; the driving wheels, 8 ft. diameter; the boiler pressure, 140 lb.; and the tractive effort, 94½ lb. per lb. cylinder pressure. The boiler is 4 ft. in diameter, and contains 174 tubes, 1¾ in. diameter. The heating surface is: fire box, 109 square feet; tubes, 936 square feet; total, 1,045 square feet. Grate area, 17¾ square feet.

The bogie wheels are 3 ft. 11 in. in diameter, the trailing wheels 4 ft. 7½ in.; the load on the leading bogie wheels is 8 tons 2 cwt., on the trailing wheels 9 tons 9 cwt., driving wheels 17 tons, trailing wheels 10 tons 12 cwt.; total weight, 45 tons 3 cwt. The tender is carried on six wheels, 4 ft. 1½ in. diameter, and holds 2,900 gallons of water—sufficient for a run of 105 miles without a stop, to Grantham—and 5 tons of coal. The total wheel base is 29 ft. 9 in.



EXPRESS ENGINE, GREAT NORTHERN RAILWAY.

The London *Engineer*, from which we take our illustration, is quite proud of the work. It says:

"The majestic proportions of these engines have always excited the admiration of engineers, and they are as good as they look. They have been built at Doncaster, and their workmanship leaves nothing to be desired. They are, perhaps, the most celebrated locomotives in the world. It would be difficult to name many types which have lived so long, and which comply so fully with the heavy demands of an exceptionally fast traffic."

Speed of Trains.

Inquiry is frequently made as to how the speed of a train may be estimated. The traveler especially is curious about the speed his train is making, and we suggest three methods by which the speed may be guessed with remarkable accuracy, as follows:

1. Watch for the passage of the train by the large white mile posts with black figures upon them, and divide 3,600 by the time in seconds between posts. The result is the speed in miles per hour.

2. Listen attentively until the ear distinguishes the click, click, click of the wheel as it passes a rail joint. The number of clicks upon one side of the car in 20 seconds is the speed in miles per hour, where the rails are 30 feet in length, and this is the case generally.

3. Count the number of telegraph poles passed in two minutes, if there are four or five wires to a pole, and in two minutes and twenty seconds, if there are only one or two lines per pole. The number of poles passed is the number of miles per hour at which the train is traveling.—*Railway Review.*

The Farmer's Complaint.

The *Northwestern Lumberman*, which usually confines itself to the price, quality, and quantity of various kinds of lumber in the various markets, and sometimes has a word for builders and contractors as to the future supply, and if the current prices are to be sustained, etc., in a recent issue went out of its way to illustrate the whims and complaints of the ordinary farmer.

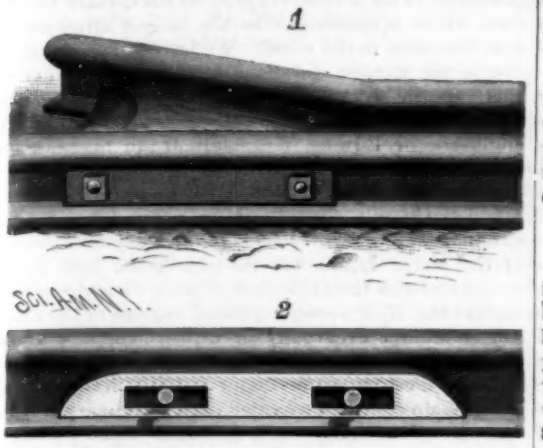
"I would prefer being almost anything to being a farmer. He has to take chances on the weather, guess whether every other farmer will put in the same crops he does, and everybody has a dig at him. When he sells his crops he has to look out that he don't get beat on the price, and everybody who sells him anything wants to get big money out of him. It is drought, too much rain, cyclones, hail storms, bugs, worms, poor seed, or something similar all the time, and the farmer never knows whether he owns a cent or not. Besides, he's always in debt, and the storekeepers cuss him because he is such infernally slow pay. Yes; it must be fun to be a farmer. But, after all, the farmers are everlastingly overestimating their adversities, and things never turn out half as bad as their prognostications. The farmer is the arch grumbler, and when he hasn't got enough trouble to make him feel at home, he borrows a supply from his neighbors, and it is the one thing he always manages to pay back."

Chills and Fever.

The sovereign remedy in the treatment of intermittent fever is quinine, and the most common forms in which it is employed are the sulphate and bisulphate, and the Boston *Journal of Health* says that, owing to its greater solubility, the latter is preferable. Several methods are employed in giving quinine. Some advocate the use of a single large dose to ward off an expected attack, others prefer to give the remedy in small doses, repeated at intervals of two or three hours. The weight of evidence is in favor of the latter method, still, in some cases, the former will be more effective. If the disease has existed but for a short time, five grains of quinine should be taken during the sweating stage, or as near as possible to the paroxysm which has passed, and repeated every four hours until ringing noises in the ears are experienced. Even if by this method the second occurrence of a paroxysm is prevented, the use of the drug should for several weeks be persisted in, and be given three or four times daily in decreasing doses.

AN IMPROVED BLOCK FOR GUARD RAILS, ETC.

A spacing and fastening attachment for guard rails, switch rails, or frogs, designed more especially for use in fastening guard rails to the rails of the main track, has been patented by Messrs. Ethelbert J. Moore and Aaron R. Paulus, of Villisca, Iowa, and is illustrated herewith, Fig. 1 showing the block applied between a main rail and guard rail when the end of the latter is bent to extend at an angle from the main rail, and Fig. 2 showing a longitudinal view of the attachment. The side edges of the block are formed to fit closely against the webs of the rails on either side, and its upper face is concave, while the lower face is of proper contour to

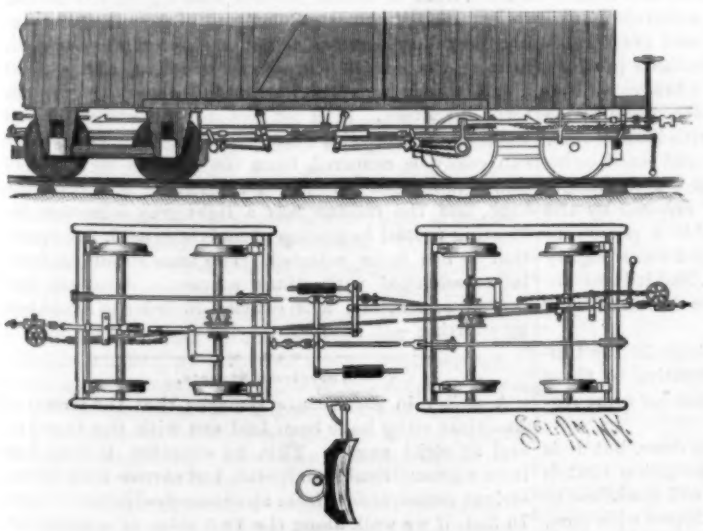


MOORE & PAULUS' FASTENING BLOCK FOR GUARD RAILS, SWITCH RAILS, AND FROGS.

fit snugly upon the upper faces of the rail bases, and each end is rounded off, the block having transverse elongated slots registering with apertures in the rails. The block is held in position by bolts passed through these apertures, fish plates being placed between the outer faces of the rail and the bolt heads and nuts, the guard rail being held firmly to the main line rail. The space between the approaching faces of the rail treads, should the guard rail tread become worn away, may be adjusted by simply loosening the nuts of the bolts and moving the block. By the use of this attachment it will be impossible for pedestrians to catch their feet in the jaw formed by approaching sections of rails, as shown in Fig. 1.

AN IMPROVED AUTOMATIC CAR BRAKE.

A brake designed to act automatically as the tension on the drawbar is released, the parts being so arranged that the brakes of each car of the train may be applied at once if desired, or so that any car breaking away from the train would be immediately stopped, is illustrated herewith, and has been patented by Messrs. Thomas De Coar and William Keast, of Russell Gulch, Col. An inclined face wheel is keyed to one of the vehicle axles, and rigidly connected with a sleeve upon which is a chain wheel carrying sockets to hold shoes adapted to be brought into frictional contact with the inclined-faced wheel. The chain wheel has a collar engaged by a lever connected to a bell crank lever connected to a drawbar, the latter having a hook at one end adapted to engage an eye on the inner end of a flat bar mounted at the end of the car, the outer ends



DE COAR & KEAST'S AUTOMATIC CAR BRAKE.

of such bars being connected with the coupling rods. The inner end of this drawbar is connected to a lever pivotally mounted between the car trucks, a similar construction being employed with each car truck, and this lever is normally held at about right angles by a spring, while chains connect the chain wheel to a perpendicular lever, which is connected with a horizontal lever that operates, through a link, the brake bars. These are provided with eccentric bearings, as shown in the small figure, with side flanges, between which the blocks carrying the brake shoes rest, the blocks being suspended from the truck frame by links, and normally held from engagement with the wheels by springs. Beneath the drawbar connected to the bell crank lever is arranged a safety rod or chain, connected to lever arms suspended upon shackles, and to these levers are connected expanding fingers bearing against the under side of the bars connected with the coupling rods, and a forward rod or bar connected with the engine or tender, so that the engineer, in case of danger, may draw upon the bars to rock the lever arms, and thus throw the two sections of the friction brake into engagement with the car wheels. The construction is such that, as long as the bars connecting the chain wheel on the car axle with the couplers are under tension, the lever pivoted between the trucks will be held substantially at right angles to the car, but when the tension is slackened a spring forces the parts into position whereby the brakes are applied. These automatic brakes are also designed for application on street cars.

New Steamers for the New York Trade.

The Hamburg-American Steamship Company is having two steamships built of 10,000 tons each, and 12,500 horse power, one at Stettin and the other at Birkenhead. These steamers are to be ready for service a year hence. They will have a length of 460 feet and will be 56 feet wide and 38 feet deep. Eleven bulkheads will divide the vessels into watertight compartments. Should two even of the largest compartments be flooded, the vessels will still be safe and navigable. The two engines will be in separate compartments, subdivided by a watertight bulkhead, and each set of machinery will drive a separate screw. The steamers will have double bottoms, and will be made of as light a draught as possible, to enable them to run up the Elbe as far as Hamburg, and to cross Sandy Hook bar at all tides. The boilers will be in three watertight compartments, cut off from each other.

Nickel Plating.

The following solution for electro-plating with nickel is used by several firms in Hainault: 500 grms. of nickel sulphate, 365 grms. of neutral ammonium tartrate, 2·5 grms. of tannin dissolved in ether, and 10 liters of water. One and one-half liters of water are first added, and the mixture boiled for fifteen minutes. The remainder of the water is then added, and the whole filtered. The *Electrician* says: "Solution yields an even white deposit, which is not brittle, and the cost of which is hardly more than that of electro-plating with copper."

Nickel plating is now effected at several works in Belgium with the following bath: Sulphate of nickel, 1 kilog. = 2·2 lb.; tartrate of ammonia, 0·725 kilog.; tannic acid with ether, 0·005 kilog.; water, 20 liters = 4·4 gallons. With this formula a thick coat is deposited on all metals in a short space of time and by a weak current.

Levy's Hydroplastic Process.

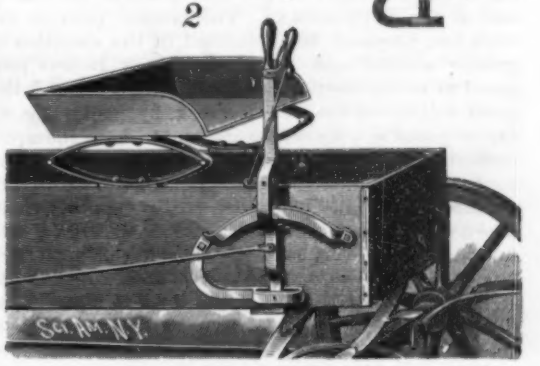
The object of Mr. Abraham Levy's hydroplastic process is the deposition of thin coats of metal upon other metals without having recourse to the use of batteries or dynamos. It is based upon a double decomposition, and permits of the electrolysis of all metals. In order to deposit a layer of nickel, for example, a solution of the simple or double salt of this metal is used. After being scoured, the iron or copper object to be nickel coated is introduced into this bath and is suspended from a zinc wire which partially enters the liquid. The zinc is attacked and the object becomes covered with a regular layer of nickel, which keeps increasing with the attack of the zinc. Iron may be substituted for the zinc. In certain cases, as in copper-coating cast iron, it is preferable to employ an alkaline bath instead of an acidulated chloride.—*Revue Scientifique.*

Queer Fancy of a Collector.

A man in Denver, Colorado, named Lyon, is said to have a collection of over seven hundred pens, no two alike. Some are of steel, some gold, some amalgam, and so on. There are pens pointed fine enough to make lines of microscopic delicacy, and others intended for men who use the first personal pronoun a great deal in their correspondence. The collection embraces specimens from England, Ireland, Scotland, Germany, and other European countries, besides America and Canada. Some are in shape like shovels, others resemble a section of stove pipe, and others are delicate and diminutive.

AN IMPROVED CLUTCH FOR WAGON BRAKES.

A simple and inexpensive device whereby the tension lever of a wagon brake may be held at any point in the arc of a circle without the use of a ratchet has been patented by Mr. Theodore Dilger, of Liberal, Ind., and is illustrated herewith. A curved iron rack bar is attached to the wagon body or box, the bar being laterally bent for a portion of its length at the top to set outward a space from the wagon body, and within a looped lower end of this bar is pivoted a tension or brake lever, having near its center a slotted or mortised portion, whereby it is held and guided along the outwardly bent portion of the upper member. The lower end of this slot works closely

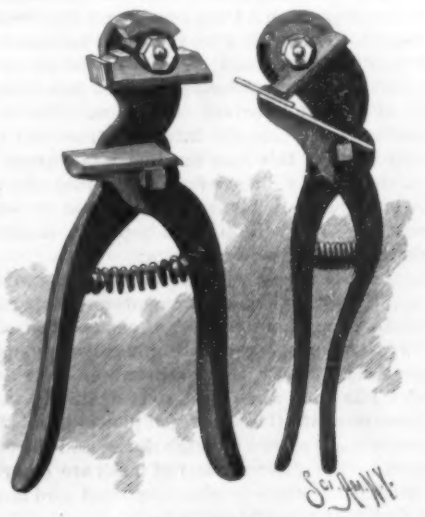


DILGER'S BRAKE LEVER.

to the under side of the rack bar, and within the slot is pivoted a pawl with a short arm extending from one side, connected by a rod with a short spring-actuated angle-grip lever, pivoted to the upper end of the main lever. The bearing surface of the pawl is preferably adapted for engagement with the upper edge of the rack bar, although it may be made to engage its under surface, as shown in the small figure, the pawl clamping the bar firmly, and its eccentric bearing surface adapting itself to wear. In operation it is only necessary to press the tension lever forward, the pawl engaging the rack bar automatically when the lever is released, while by slightly manipulating the grip lever the pawl is disengaged and the lever can be drawn back.

AN IMPROVED WRENCH.

A novel form of self-adjusting wrench, wherein the parts are so arranged that the device may be used as a pair of pinchers or pliers, has been patented by Mr. Walter L. Gibson, of Sebastian, Brevard County, Fla., and is illustrated herewith, one figure representing the wrench as the parts appear when adjusted to receive a large-sized nut or bolt, and the other showing the adjustment for use as pinchers or pliers. The object to be held is not clamped directly by the larger fixed jaw of the wrench, but by a swinging block connected to the jaw by a pin, the block having a long and a narrow bearing face, the former much closer to the axis of the pivot pin. The motion of the block is limited by a ridge or projection on the jaw, holding the block from turning completely upon its support; and when the wrench is to be used in connection with large nuts or bolts, the long bearing face of the block is moved to a position to be brought into engagement therewith as the jaws are brought together. When small nuts or



GIBSON'S WRENCH.

bolts are to be operated upon, or small articles are to be grasped, the narrow bearing face of the block is turned down to be substantially parallel with the smaller arm of the jaw. The jaws are normally held open by a spiral spring supported by studs upon the inner approaching faces of the handles.

THE Metropolitan Cattle Market, London, is the largest of its kind, covering 31½ acres and costing $1,000,000.

THE NEW AQUEDUCT.

The great aqueduct for carrying the water of the Croton River basin to the metropolis, in quantity adequate to supply its wants for years to come, is now fast approaching completion. When the last brick is in place, and the last masonry filling completed, New York may safely boast of possessing one of the wonders of the engineering world. Fifty years ago the old Croton aqueduct was considered a wonderful achievement. It has since been eclipsed by others. The present work, of three times its capacity, driven by preference through the solid rock, and carried thirty and three-quarter miles in a line almost straight, again leaves the other water conduits of the world behind.

The general features of the aqueduct have been often described by us, and much information concerning it will be found in previous issues of this paper and of the SUPPLEMENT. The general plan of the work has, however, been modified in the direction of greater solidity and finish. Originally it was proposed to utilize the peculiar conditions, as regards the great solidity of the country rock, by dispensing, as far as possible, with brickwork, and to have the aqueduct little more than a gigantic tunnel. Where the rock was not sufficiently firm, brick was to be used to re-enforce it. This plan was wisely departed from. The aqueduct is now lined throughout with brick, laid in cement mortar. The walls vary in thickness from twelve inches upward. As the rock excavation is quite irregular, the space behind the brick lining is to be filled with the best rubble masonry. Thus a smooth conduit is secured, one in which friction will have but a slight retarding influence, and the area or outline of the cross section can never be reduced or altered by debris falling from the roofs. These are the principal advantages due to the brick lining.

The old aqueduct, upon which the city is still entirely dependent, was built as near the surface as possible. It followed a devious course, for this reason much exceeding the new one in length. Considerable difficulty was encountered in places, owing to the poor soil, and portions of the line have sunk twelve or fifteen inches, with the lapse of years, and have become badly cracked. By careful repairs these portions have been made as good as ever. The new structure, embedded in solid granitoid and gneiss rock and marble, can only be disturbed by an earthquake, while its reduced length and freedom from sudden curves may increase its relative capacity beyond the calculations of the engineers charged with its construction.

The route was determined and laid out by the most careful surveys. Alignment monuments were set with their foundations below the reach of frost. In the center of each was a copper bolt. Where the line ran over surface rock, the monument was dispensed with and the bolt was set directly in the rock. Then a second sight was taken, and the exact alignment was marked with a center punch and hair line upon the top of the bolt. Bench marks were also placed as the basis of leveling operations. To insure the utmost accuracy, much of this work was done at night, the sighting being done against a plummet lamp. This avoided the error due to refraction. The line thus fixed was transferred through the shafts to the tunnel, giving both alignment and level. The shafts are about eight by seventeen feet, and are distant about one and a quarter miles from each other. Hence a base line of less than sixteen feet had to be used to drive the half mile of tunneling in both directions.

The ends of two wires were dropped down the shaft, their upper ends being secured above the surface. They carried in suspension a long iron beam representing a plumb bob. The wires were spaced as far apart as the shaft would permit, and were adjusted so as to be truly vertical. The elongated plumb bob hung in a trough of water to prevent oscillation. The wires at the surface were brought into the true line of the tunnel, and from this base the line was started at the foot of the shaft. Plugs were driven into the roof to act as monuments. The result was that in some instances the survey lines from separate shafts came within an inch of exactly meeting.

The same exactness and carefulness as regards detail was applied to all the measurements and inspections of material. A continual record of cement tests is kept on file, the reports being thoroughly systematized. Briquettes are made, soaked in water, weighed, and tested. The time when steel rods definitely weighted can penetrate into the cement briquettes is noted. The dry cements are passed through sieves, and the portions retained by the different sizes of mesh are determined. The dimension stone is also inspected and measured with similar thoroughness.

The section of the greater part of the aqueduct in general terms resembles a horseshoe 13·53 feet high and 13·60 feet wide. Over the top an arch of 6·80 feet radius is carried. This rests on two side walls, themselves forming segments of circles of 20·92 ft. radius, fixed by an accurately placed template. The side walls at their bases have courses of special bricks, whence springs an invert arch for the floor, which is of 18·50 feet radius. These proportions give a tunnel equivalent in cross area to a circle of 14 feet radius. The friction is slightly greater than if the conduit were circular. For most of the distance its rate of descent is 7-10 foot per mile.

There was no possibility of blasting out the rock so as to permit the brick to lie in close contact with it. Accordingly, it was determined to fill the space back of the walls, as fast as they were run up, with rubble masonry. The general requirements were that the brickwork should be carried up in sections or benches, and as each was finished that the rubble should be laid in the space behind by hand. By the terms of the contract, a specified rate per cubic yard was to be paid for such filling. To determine its amount, it became necessary to know the exact volume of the tunnel. Then by subtracting from it the known external volume of the brick lining, the amount of rubble presumably laid and to be paid for by the city would be known.

An instrument called colloquially a "sunflower" has been devised for this purpose. It is essentially a full circle protractor, arranged for vertical mounting on a tripod, with two levels at right angles to each other, and the usual adjustments. It is carried by a tube of about one-half inch bore passing through the usual ball and socket joint. A given portion of tunnel is laid off into lengths varying from three to ten feet. At each division a candle is placed exactly in the vertical plane containing the axis. The "sunflower" is set over the candle and adjusted so as to be truly vertical. Instead of a plumb bob the tube is used to fix its position. The attendant sights down the tube and shifts the instrument until directly over the candle. The level of the tunnel bottom has previously been taken. The face of the protractor is about 18 inches across, and an arm pivoted at the center of the protractor face is arranged to turn around freely. A pole, divided into feet and tenths of feet, shod with an iron strap, is placed upon the rotary arm, is brought to the vertical or zero reading of the instrument, and is pushed upward until it strikes the rock above. The reading in feet and tenths is taken, the pole is swung through ten degrees, and a second reading taken, and so on all around the circle. If necessary, even more readings are taken. The 180° reading gives the elevation of the center of the instrument, so as to fix the relation of the excavation to the brick lining.

Cross section sheets containing the outline of the tunnel are provided, printed on rather thin paper. When the readings are taken to the office, they are plotted on these sheets. A protractor printed on thin paper is mounted on a glass plate, beneath which the light can enter. The section sheet is laid upon this protractor, whose lines and figures can be distinctly seen through it. The point on the section sheet corresponding to the elevation of the center of the sunflower is brought exactly over the center of the protractor. Then the readings for the different degrees are marked off, and connected afterward by pencil lines. By planimeter or trigonometrical methods the area of the cross section is determined.

After the tunnel had been completed in parts, and these measurements had been taken, it was found that the filling back of the brickwork had been most perfunctorily performed, and in some places had been entirely omitted. As the contractors were paid in the neighborhood of seven dollars a cubic yard for tunnel excavation, and received five dollars per cubic yard for refilling the same with rubble masonry, the object of such neglect was obvious. They had every incitement to make the opening as large as possible, and then to leave it unfilled. In many cases the excavation was carried six feet higher than necessary, and great cavities of this height were left open. Sometimes portions of the cavities were partitioned off by a bridge wall so as to be masked, and thus escape notice. The space back of the side walls was often filled with loose stones, through and between which a long rod could be inserted clear back to the original rock. Two sample cavities above the rock, which were entered by the writer, were sufficiently lofty to enable a person to stand erect therein, and each contained some eighty cubic yards of space, for filling which, had it been undetected, the contractors would have collected four hundred dollars.

A very large corps of inspectors are kept in the tunnel, and should be an absolute preventive of these practices. Unfortunately, they have not for some reason succeeded in such prevention.

Much of this defective work has been done, but it is being detected by the thorough examination that is now being prosecuted, and the defects will doubtless be remedied in due time. A heavy rod tipped with iron, or a solid iron bar, is used as a sounder. With this the brickwork is struck, and the more or less hollow sound discloses the cavities and loose filling. By practice considerable expertness with this crude system is attained. Where a cavity is found, the wall is opened and the contractor is forced to refill it. In some cases liquid mortar, or grouting, is used, in other cases a gang of men are made to regularly build up the cavity. It will be noted that this method is applied to the completed structure. Had the inspectors done their duty, it would be quite unnecessary.

It cannot be said that the defective filling, as far as it has gone, will have any disastrous effect. Most of the aqueduct is to deliver water by gravitation only. But in the future it may be called upon to do high pressure work. Its capability for such service may be of the utmost importance. The city of New York is paying for the best work, and is entitled to have it. No excuse can be accepted for inferior filling or other neglect. By the special efforts made at this late day, there is reason to hope that good masonry will be secured for practically the whole length of the aqueduct.

To render the aqueduct fully effectual, more water than the present Croton Lake can hold must be impounded. This is to be supplied by the Quaker Bridge dam, which is planned to be the largest structure of that character in the world. We have no space here to discuss the mooted questions of the practicability of this gigantic work. The mathematical bases for its erection will be found presented by one of the aqueduct engineers, Dr. Edward Wegmann, Jr., in his work on "The Design and Construction of Masonry Dams." The very able reports of the Chief Engineer, Mr. Benjamin S. Church, should also be referred to. If the Croton River watershed is made the immediate source of the water supply for the metropolis, that by no means excludes the utilization of more distant sources. Should the New Jersey highland regions or the Catskill Mountains eventually be utilized, the new aqueduct, with its capacity of 250,000,000 gallons per day, will be a most important factor and link in the system.

The main contracts awarded prior to January 1, 1887, aggregate $13,801,117, nearly $3,000,000 under the engineers' original estimate. It would seem that this sum, with the very large staff of city employes engaged on the work, should have secured immunity from the evils we have so briefly described.

Determination of Phosphoric Acid.

The author proposes an abridgment of the molybdic method. If the ordinary yellow precipitate is heated to 400° to 500°, water and ammonia are expelled, and there remains a molybdenum phospho-molybdate almost of a black color. This compound, within certain limits of temperature, is very permanent, and as it is not hygroscopic, it can be weighed. The author proceeds as follows: The solution of the phosphate prepared as usual, and containing nitric acid and from 20 to 25 per cent ammonium nitrate, is precipitated at 50° to 60° with solution of molybdic acid, stirring constantly, and is allowed to stand for some hours without further heating, but with diligent stirring. After two to three hours the precipitate is collected on a filter, washed with a 20 per cent solution of ammonium nitrate slightly acidulated with nitric acid, until ten drops react neither with hydrogen sulphide nor (if iron is present) with potassium ferricyanide, and then a few times with cold water, or once each with a small quantity of cold water, alcohol, and ether. The dried precipitate is removed as completely as possible from the filter into a flat platinum capsule. The filter is incinerated separately at the lowest possible temperature in a platinum crucible, the ash is added to the bulk of the precipitate in the flat capsule, which is then covered with sheet platinum and ignited over a "Maste" burner with a triple air current at a temperature which suffices for a slow decomposition of the precipitate, indicated by blackening. If there is a considerable quantity of precipitate it is removed, after a time, from the flame, crushed with a glass rod having its end melted broad and flat, and heated again, bringing the yellow portions, which still remain unchanged, nearest the sides of the capsule which are hottest. In about fifteen minutes the mass is generally of a uniform blackness. It is let cool in the exsiccator and weighed. It contains 4·018 per cent P_2O_5. The residue can easily be removed from the capsule by means of dilute ammonia. If the temperature has been too high, and the residue has a light gray reflection, indicating partial formation of molybdic acid, the operation is not to be rejected. The mass should be carefully moistened with dilute ammonia, dried up, and heated afresh, but with caution in order to avoid loss by spurting.—*C. Meinecke.*

American Streets.

A writer in *La Nature* remarks that the streets of American cities have been laid out with the tape-line and at right angles. This, he observes, is very fine from a geometrical standpoint, but carries with it very serious consequences from an economical point of view. In fact, if we walk along the two sides of a square instead of following a diagonal, the distance is increased in the proportion of 40 per cent; that is to say, instead of walking 100 feet, we walk 140. Hence a loss of time, strength, and money. Prof. Haupt has calculated that the opening of two diagonal streets in Philadelphia (850,000 inhabitants) would reduce the extreme distances by one mile and a quarter. The annual number of passengers carried by the cars being 125,000,000, the total saving would reach about $180,000 per mile traveled. The passengers would gain 3,565 years in time and would save more than 8,000,000 horse power in motive power.

Correspondence.

The First Steam Engine in America.

To the Editor of the Scientific American:

In your issue of June 16, page 371, you publish an extract from the diary of Manasseh Cutler, LL.D., of Ipswich, Mass., giving a description of what you state was "probably the first practical stationary steam engine used in the United States." Knowing your reputation for accuracy, I beg to call your attention to the accompanying document on "Josiah Hornblower and the First Steam Engine in America," published by the New Jersey Historical Society, and also to the inclosed copy of a letter from Mr. Justice Bradley, of the Supreme Court of the United States, which was attached to the relic described, when on exhibition at the Centennial Exposition in 1876. From these authentic and well proved statements there can be no doubt that Mr. Hornblower's engine was the earliest ever operated in this country, antedating the one described by Mr. Cutler by 34 years. The description of the engine in the document by Wm. Nelson—published by the N. J. Historical Society, and which I send by this mail—is so comprehensive and complete that it is worthy of a review and consideration by your valuable paper.

I might add that the relic referred to in Mr. Justice Bradley's letter is now the property of the N. J. Historical Society, having been donated by Mr. Meeker's son, Stephen J. Meeker. CHARLES BRADLEY.

Newark, N. J., June 20, 1888.

WASHINGTON, September 20, 1875.

David M. Meeker, Esq.

DEAR SIR: The steam engine of which you possess a relic was, as you suppose, the first ever erected on this continent. It was imported from England in the year 1753, by Col. John Schuyler, for the purpose of pumping water from his copper mine, opposite Belleville, near Newark, N. J. The mine was rich in ore, but had been worked as deep as hand and horse power could clear it of water. Col. Schuyler having heard of the success with which steam engines (then called fire engines) were used in the mines of Cornwall, determined to have one in his mine. He accordingly requested his London correspondent to procure an engine and to send out with it an engineer capable of putting it up and operating it. This was done in the year named, and Josiah Hornblower, a young man then in his 25th year, was sent out to superintend it. The voyage was a long and perilous one, and Mr. Hornblower expected to return as soon as the engine was in successful operation. But the proprietor induced him to remain, and in the course of a couple of years he married Miss Kingsland, whose father owned a large plantation adjoining that of Col. Schuyler. The late Chief Justice Hornblower was the youngest of a large family of children which resulted from this marriage. Mr. Hornblower's father, whose name was Joseph, had been engaged in the business of constructing engines in Cornwall from their first introduction in the mines there about 1740, and had been an engineer and engine builder from the first use of steam engines in the arts, about 1720.

The engines constructed by him and his son were the kind known as Neweomen engines or Cornish engines. That brought to America by Josiah was of this description. Watt had not then invented his separate condenser nor the use of high pressure; but it is generally conceded that, for pumping purposes, the Cornish engine has still no superior. After 1760 the Schuyler mine was worked for several years by Mr. Hornblower himself. The approach of the war in 1775 caused the operations to cease. Work was resumed, however, in 1792, and was carried on for several years by successive parties. It finally ceased altogether early in this century, and the old engine was broken up and the materials disposed of. The boiler, a large copper cylinder standing upright, 8 or 10 feet high, and as much in diameter, with a flat bottom and a dome-shaped top, was carried to Philadelphia. The relic in your possession was a portion of the cylinder, and was purchased by some person in Newark. In 1864 I met an old man named John Van Emburgh, then 100 years old, who had worked on the engine when it was in operation, in 1792. He described it very minutely and, I doubt not, accurately. It is from his description that I happen to know the kind of engine it was, although from the date of its construction and the use to which it was put, there could have been but little doubt on the subject.

What changes have been wrought in 122 years! What mighty power has been created on this continent in that time by the multiplication and improvement of the steam engines! We may well look upon this relic with a sort of superstitious veneration, looking forward as well as backward, and wonder what another century will bring forth!

Respectfully your obedient servant,

JOSEPH P. BRADLEY.

PARADISE, by Tintoretto, is the largest painting in the world. It is 84 feet wide, 33½ feet high, and is now in the Doge's Palace, Venice.

The Inequalities of Men.

M. Lapouge, of Montpellier, has recently delivered before the Faculty of Natural Sciences in that town a series of lectures on inequalities among men, in the course of which he said that the political dogma of equality rests on hypotheses which are utterly false. He distinguished four social types among mankind:

1. The initiators, who show mankind the way into the region of the unknown, and who go in front. Restless and daring, with an intelligence which is at least equal to the average, men of this type do not travel readily along beaten tracks. New ideas are the breath of life to them. They spend their lives in new creations, they are often wrecked, but the true genius represents the most perfect form of this type. 2. Men of spirit, of intelligence, who, possessing no creative power themselves, yet carry out and perfect the ideas and discoveries of the first type, to which they are really the complement. 3. Men who, with much or little intelligence, can work only with others, who mistrust every new idea not accepted by all the others, but who seize it with avidity when their neighbors adopt it. If intelligent, these men are docile, but they dislike every change in routine, and they represent the dullness of the mass in the face of every reform. 4. Men of this type are not fit to attain even the smallest step in culture.

Evidently every man cannot be classed under one or other of these divisions. In human societies clear lines of demarkation do not exist, but for general purposes the distinction is sufficiently evident. The superiority of a race or nation depends on the greater or smaller number of men of the first two classes. The race which is richest in the first type is the blond dolichocephalic, and this has been the case even when the people among whom they lived were not of this kind. In Egypt, Chaldea, Assyria, Persia, India, and even in China men of this type ruled. In the Greek and Roman world it was the same, and it is so still. In our own day the rank of a nation corresponds with the strength of the blond dolichocephalic element. The Gallic and Frank elements which made France great were of this type, and it plays the same part in England, Germany, and America. Near these come the Semitic and Mediterranean races, who had reached a high grade of civilization when the blond dolichocephalic peoples were still savages. The remainder of mankind must be reckoned the passive races. The brachycephalic races of Europe, the Celto-Slavs, rarely produce men of the first intellectual type. In the social changes of recent years brachycephalic men, who form the lower classes, have been elevated and brought forward, and herein, the lecturer thought, lies the great danger of the future deterioration of the French nation.

Exotic Flax.

Consul Williams, of Rouen, says that M. J. De Turck, of Lille, who is a manager of spinning mills, has brought to light a textile plant of Chinese origin, which has some analogy with ramie. He claims to have discovered a process for degumming this textile, which comes already decorticated, and to produce from it threads of great strength and beauty. He has termed the textile *lin exotique*. It is claimed for this material that in its native country its cost is from 1½ cents to 2 cents a pound, and from 2½ to 3 cents a pound laid down at Marseilles, whereas flax costs, according to quality, from 10d. to 1s. 9d. per kilogramme. The exotic flax, without assorting, is fit for the coarsest fabrics or the finest, the latter only requiring the usual more careful and complicated preparation. The finest lace and the strongest cord can be made from it, as well as an infinite variety of intermediate fabrics, such as table cloths, napkins, carpets, plush, wearing apparel, etc. It is spun without combing, thereby saving 40 per cent of waste incident to flax combing. The material can be worked with the ordinary flax machinery. The textile can be mixed with flax, silk, wool, and cotton. Its strength is very great, and a sewing thread can be spun which requires no twisting. The refuse is utilized and can be worked in the same manner as cotton, which it closely resembles. If desired, the long fiber can be broken up by an ordinary crusher and reduced to the usual length of cotton fiber.

Consul Williams adds that the various fabrics made from this plant, which can be seen at Lille, appear to indicate beauty, strength, and general utility. The plant utilized by M. De Turck in his invention is the dolichos of Tonquin (the dolichos catjang of Cochin China). This is cultivated everywhere throughout Tonquin, and bears also the name of *dau*. The plant produces the dolique, or Tonquin bean, and next to rice is the most important crop of the country. It is cultivated on thousands of acres of land bordering on the sea, by the side of the rice swamps of Hunghoa, and the banks of all the rivers. The seed is sown in February and March in the north, and a little later in the south. When inundations are feared, the dolique is planted alone, or with other seeds to form clusters. In the latter case Indian corn or castor beans are planted, as, in addition to the shade which they afford, they produce a valuable crop. This crop is suitable to lands which are too elevated or too porous for rice. It is also cultivated as an alternate crop with rice, to prevent the exhaustion produced by two successive rice crops on the same land. It is cultivated also to rid the land of weeds. It usually ripens about the first of May, or a month earlier than the rice crop. At the time of harvesting the dolique, the country is overrun with women and children gathering the ripe pods in small baskets. The men in long files are seen wending their way to the villages, with long bamboo sticks upon their shoulders, on the ends of which the baskets are balanced. As there is no rest for the land in Tonquin, the stalks are buried with the plow. Occasionally a few are saved for fuel, bedding for the buffaloes, or for manure; but the quantity thus used is small.

Building a Home.

Presuming that a location has been selected, with a special view of arrangement of cesspools, wells, cisterns, and outhouses, which should flow down and away from the foundation of the house, and which should at no time flow toward you from neighboring dwellings, the greatest thing then to consider is to preserve sanitary conditions. It seems somewhat superfluous to warn one against keeping decayed vegetables around the cellar, but there are thousands who, through sheer neglect, invite weekly and daily all germs of infectious disease through this most common of household evils. In the cellar, above all places, plenty of fresh air should be admitted. There is hardly a housekeeper, no matter how vigorously the reader may resent this imputation, who is entirely free from the charge of shiftlessness. Wherever refuse bits of food are left to mould, a plate left unwashed, a wash cloth uncleansed, and even where fresh milk, meat, or other foods are left uncovered in living rooms or bed rooms, there disease will propagate, not instantly, understand me, in a virulent, venomous form, but insidiously the impurities arising from the slowly decomposing matter will leave their effect upon all inhaling the air of the apartment impregnated by the rising gases.

Many houses are now built to rent or sell, and constructed in the most flimsy manner. They are built to rent or sell, and the mere advertisement that a house is furnished with the most improved sanitary appliances should not be considered as a sufficient guarantee. The cellar should be visited. If its walls are cracked, damp, or colored with mould, if water stands upon its floor, and if light and ventilation are not provided for, seek some other habitation. Of course newly constructed walls are always damp until seasoned by time. A great amount of water is used in the mortar and plastering, and much of this must evaporate before the building is fit for occupancy. Neither should a house freshly painted with lead paints be occupied until the paint is well dried. The living rooms should be placed on the sunny, airy side of the house, and the bed rooms examined with reference to their means of ventilation.—*Philadelphia Home.*

Roaring in Horses.

Mr. F. Raymond, F.R.C.V.S., of the Royal Horse Infirmary, Woolwich, has announced that successful experiments have been made in the surgical treatment of horses for the grave defect in respiration known as "roaring"—a defect which appears to be on the increase, and which often renders valuable horses almost, if not quite, valueless. The operation has been devised by Dr. Fleming, C.B., principal veterinary surgeon of the army, who for some years has made a special study of the morbid conditions which give rise to the impediment in breathing that causes such distress and noise. It consists of an operation on the larynx for the removal of the obstruction. Under his direction Mr. Raymond has recently operated upon two army horses which were to have been cast for "roaring," and in one case complete, and in the other almost complete, success seemed to have been attained. A great advantage of Fleming's method is that the animal suffers no pain, being chloroformed; nor does it experience any immediate subsequent inconvenience in eating, drinking, or breathing. The horses operated upon were watered and fed in the usual way as soon as they recovered from the narcotic; so that even if the operation chanced to be unsuccessful, the animal is no worse than before. The scar which remains is very small and not noticeable. Mr. Raymond predicts that Fleming's method of laryngotomy will take a position among the most useful in veterinary surgery.

OFFICIAL trials of a new form of log have recently been made on board some of the French torpedo boats. The log is made of bronze of cylindro-conical form, and weighs about 5·5 lb. It is provided with a hollow tube running down its center, which is connected by a canvas-covered India-rubber tube to a pressure gauge on board. When the ship is under way the flow of the water past the log establishes a partial vacuum in the tube, and causes the pointer of the pressure gauge to move over its dial, which is graduated to give the speed of the vessel from 4 up to 25 knots.

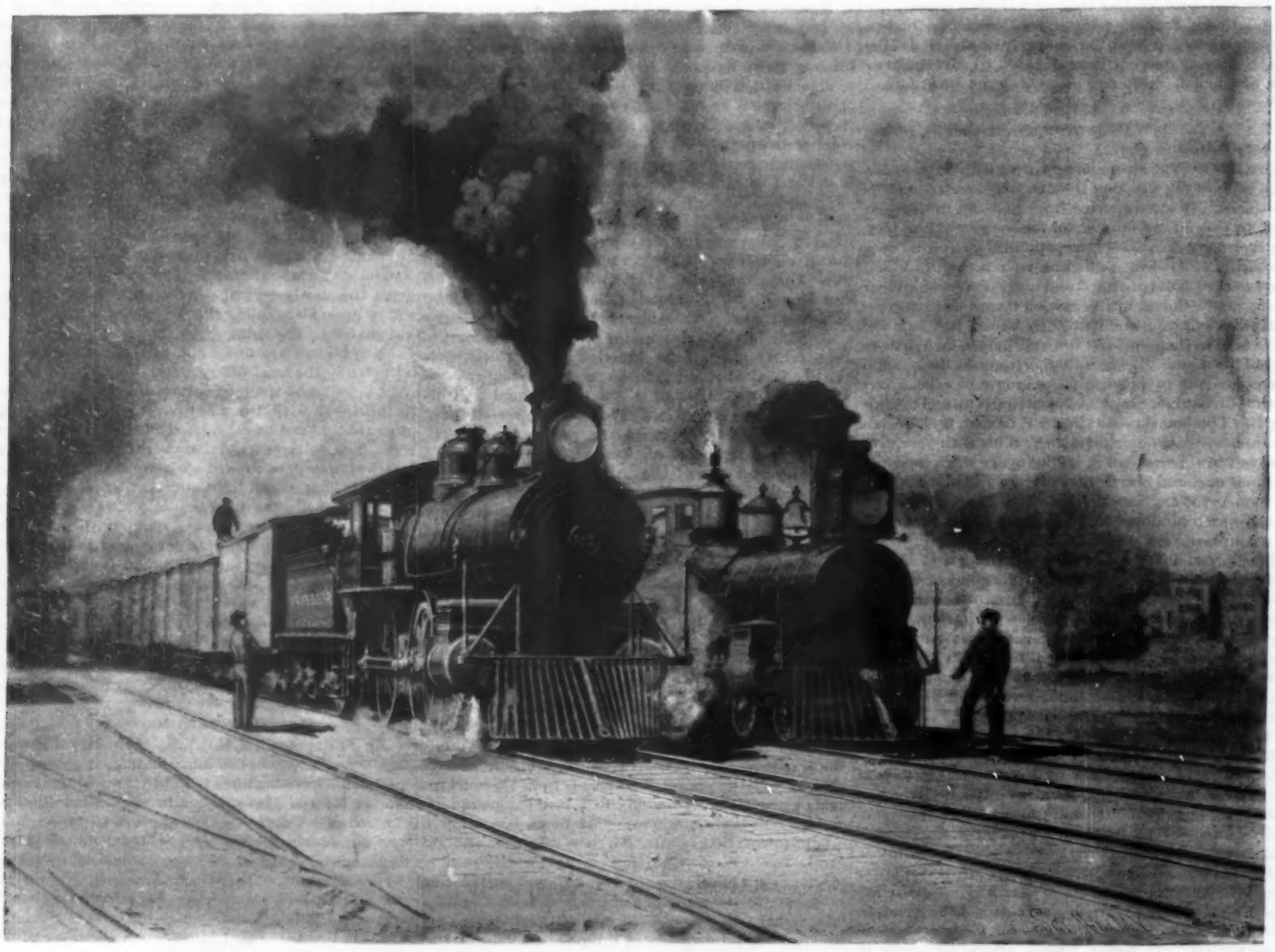
A LOCOMOTIVE WITH GREAT STEAMING CAPACITY.

Within a month past six new locomotives, embodying some striking features, have been placed on the New York, New Haven, and Hartford Railroad, to run between New York and Springfield and intermediate points. These locomotives were built at the Baldwin Locomotive Works, Philadelphia, from original designs, and one of them is shown in the accompanying illustration, where it is represented in comparison with a full sized locomotive of the ordinary type. The great size of the boiler, the top of which is 10 feet 9 inches high, or only 3 feet below the top of the smoke stack, at once attracts attention whenever the engine is seen, and the corresponding size and weight of all the working parts, except the moderate sized driving wheels, are matters of comment among all the engineers under whose notice they have come.

The cylinders of these engines have a diameter of 20 inches by 22 inches stroke, the steam ports being 1¾ by 16 inches. The driving wheels are 68½ inches diameter, and the engine truck wheels and tender wheels 33 inches diameter. The spread of the driving wheels is 9 feet 1 inch, and the total wheel base of the engine 23 feet 7 inches. The total wheel base of the engine and tender is 47 feet 9½ inches, and the length of engine and tender over all is 58 feet 2¼ inches. The tender has a capacity for 6½ tons of anthracite coal and 3,200 gallons of water, and is fitted with a water scoop for taking up water from a long tank laid between the rails—a system which has not heretofore been employed on this railroad, but for which the company are now getting ready by placing tanks in position at the desired distances to facilitate long, straight runs.

The weight of the engine in working order is about 110,000 pounds, the weight on the driving wheels being 68,000 pounds, and on the front truck wheels 42,000 pounds. The weight of the tender, with coal and water, is about 70,000 pounds, making the total weight of engine and tender, ready for service, 180,000 pounds. The boilers are wagon top in form, 60 inches diameter at the smoke box end, and the fire boxes are 6½ feet long by 34⅜ inches wide inside. These engines are designed for an ordinary working steam pressure of 160 pounds, which, we are informed, is obtained and carried as readily as 140 to 145 pounds on the locomotives heretofore in use on the road.

The present superintendent of motive power of the company, Mr. J. Hennay, Jr., was formerly for many years in charge of their shops at Hartford, where many locomotives of excellent design and fine finish were turned out, which have done and are doing good service on the road. These new engines, however, have been specially designed for high speed for long distances, drawing heavy trains, with which they have, thus far, been shown to easily make sixty miles an hour on any comparatively straight sections of track. In the matter of first cost these engines seem marvelously cheap, their approximate cost being stated at about $10,000 each, the establishment at which they were made now turning out completed locomotives at the rate of two a day. The dimensions of the boiler and fire box, with the great amount of heating surface provided, give them extraordinary steam making power, and it is claimed that they are economical of fuel. It is not unlikely, also, that in providing engines with such extra steaming capacity, the company are anticipating the enforcement next winter of regulations compelling the railroads in that section to heat their cars by steam, and discard entirely the car stove.



A LARGE LOCOMOTIVE ON THE NEW YORK, NEW HAVEN, AND HARTFORD R.R.—(From a photograph.)

Manufacture of Quinine.

Within the last twenty years the growing of the bark has been established in India, and the alkaloid is now successfully made at the government works at Sikkim. The whole of the quinine in yellow bark can be extracted in a form undistinguishable, either chemically or physically, from the best brands of European manufacture. This can be done so cheaply that so long as the supply of bark is kept up, quinine need never cost government much above 25 rupees per lb. It is pointed out that the price of English-made quinine in the London market is at the present time somewhere about this figure.

The bark is first reduced to powder by means of a Carter's disintegrator, and this powder is passed through a scalper, the sieves of which are made of silk and have 120 meshes to the lineal inch. This extremely fine powder in the proportion of 100 parts is mixed with 8 parts of commercial caustic soda dissolved in 500 parts of water, and there is then added 600 parts of a mixture of fusel oil 1 part and kerosene oil 4 parts. Slaked lime may be used instead of the caustic soda, 15 parts of it being intimately mixed with the powdered bark before the water is added. The whole mixture—bark, alkali, water, and oils—is next thoroughly agitated in barrels for four hours, then allowed to rest, and the oily layer drawn off from the top. This oil is again agitated for five or ten minutes with water acidulated with hydrochloric or sulphuric acid, whereby the alkaloids are dissolved out from the oil. Separation is again effected, the oil being transferred to the bark mixture, and agitated with it for two or three hours; again drawn off and washed as before in the same acidulated liquor. This process is repeated a third or fourth time, or until it is found by testing a small quantity of the oil that the bark has been thoroughly exhausted of its alkaloids. The quantity of acid required to take up the alkaloids from the oil depends, of course, on the quality of the bark operated on. If the bark contains 4 per cent of alkaloids, about 2 lb. of sulphuric acid mixed in 20 gallons of water are sufficient. The after-treatment of the acidulated solution of alkaloids is simple. The solution is first neutralized with ammonia or soda and set aside to crystallize. The crystals are collected on a cloth and drained, then dissolved in about fifty times their weight of boiling water, and filtered hot through a little animal charcoal. On cooling after filtration, the crystals again form and are separated as before from the mother-liquor by filtration. The crystalline mass obtained is then placed in small lumps on sheets of white blotting paper stretched on slabs of plaster of Paris. By this means they are practically dried. They are afterward thoroughly dried by being laid on blotting paper in a room heated to about 10° above the temperature of the open air. The foregoing presents the salient points of Mr. Gammie's process for the manufacture of "sulphate of quinine." The resulting product doubtless contains other alkaloids than quinine, but in what proportion there is nothing to indicate.—*Chem. and Druggist.*

Electrical Phenomena.

In a note to the *Army and Navy Journal*, Lieut. P. H. Uberroth, of the U. S. S. Dexter, at New Bedford, Mass., says that on June 15, at about 9:40 evening, while lying at anchor, a violent thunderstorm passed over us, a thunderbolt striking the vessel, shattering her main-topgallant mast and pole, shaking the vessel from stem to stern.

Lightning flashes continued without any apparent intervals of obscurity, thus producing a continuous illumination about us, enabling us to view the surrounding country as at midday. The lightning struck the main truck, and passed down the mast to the eyes of the wire rigging, at which place it was shunted off, passing down the rigging on both sides to the water. During the conduction of the electricity, loud crackling sounds were heard, blue flames were visible around and about the shrouds and smoke-stack, and huge balls of fire flew from the vessel on all sides.

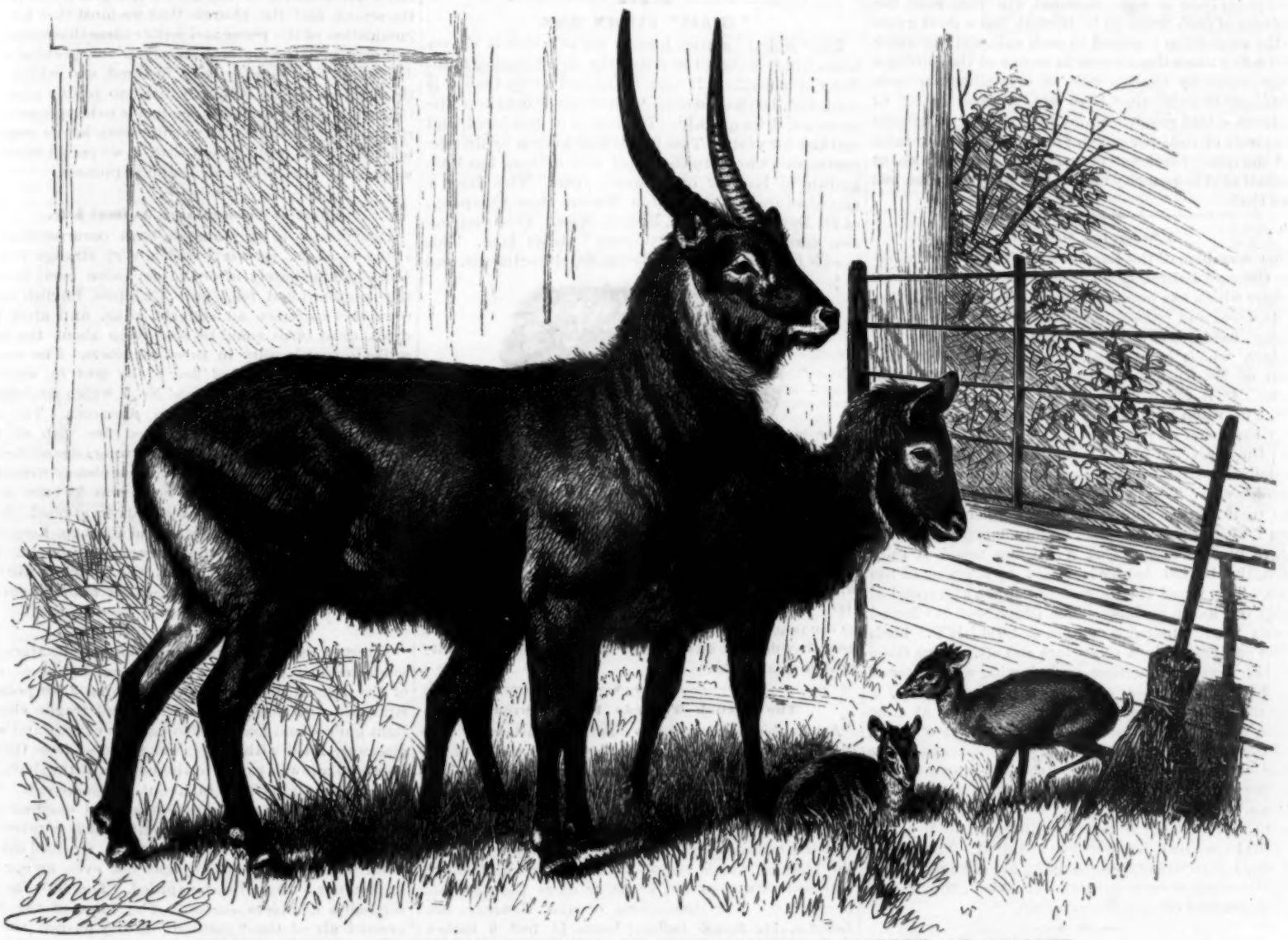
WATER BUCK AND DWARF ANTELOPE IN THE ZOOLOGICAL GARDEN AT COLOGNE.

"Goliath and David among the antelopes," one might exclaim when looking at the animals in the group shown in our engraving. In fact, it is difficult to think of two animals which differ more widely, and yet they both are antelopes. This difference in the outward appearance of the water buck and the dwarf antelope no longer seems strange after we have considered the animals with their proper backgrounds, and have taken the trouble to understand their habits by the light of the researches of modern naturalists. Then we must see that they are suited to their habitats, to their own peculiar abodes, for the occupants must differ as their dwellings do, that they may exist in them.

The water buck (Antilope unctuosa Laur.) is the antelope of the low river lands of Western Africa, specially of the Senegal region. Here they wander in little herds--each consisting of a buck, which acts as leader, and several females, with their young—through the reed-covered marshes and the shallows of the river beds which spread out like ponds, where they are enabled, by their long, thick, and well oiled hair, to browse for hours at a time. This heavy coat is very unusual for a tropical animal, but is well adapted to the water buck's habits. In fact, it forms his most striking characteristic. Although his hair is long and close, he gives the impression of having a ragged and shaggy coat. From the ground color—a dark, glossy brown, which runs into black on the extremities—the white marking on the head, neck, and hind quarters stands out clearly enough to relieve any monotony; but his proudest ornaments are the beautiful, slightly curved horns which make him one of the most imposing objects among the antelopes and one of the greatest attractions of a zoological garden.

The dwarf antelope (Antilope pygmæa Pall.) or bush buck, as it is called for the sake of distinction, is as well adapted to the "bush" of Africa as is the hedge sparrow to the thorn hedges and brambles of our meadows and woods. By virtue of his almost incredibly small size—his body is scarcely a foot long and proportionately high—for a hoofed animal, the "bush," with its strong thorns and millions of lianas, forms a safe labyrinth of comfortable paths with which he is perfectly familiar, and where the table is bountifully spread for him with tender mimosa leaves and young shoots and sprouts of all kinds. Here he lives a happy, quiet life with his mate, for the dwarf antelopes always live in pairs, so long as he is not disturbed by his enemies. But of these he, like all small and defenseless animals, has a great many, chief among whom are the leopard and, of course, man. The natives do not molest him much, because he is hardly sufficient for a negro's appetite, and at first the white hunter finds it difficult to catch him, because his color, a dark bluish gray, blends so well with the color of the mass of twigs, stalks, and vines as to make him almost invisible; but as he learns his ways, the hunter is no longer deceived by his standing perfectly still and then sliding softly and slowly away, and consequently the hunt becomes more successful, and, judging from Brehm's description, is a real delight.

The dwarf antelope seldom thrives in captivity, but if it once accustoms itself to this condition of life, it settles easily to subsequent changes.—*Illustrirte Zeitung.*



WATER BUCK AND DWARF ANTELOPE IN THE ZOOLOGICAL GARDEN AT COLOGNE.

Danger from Electric Lighting Wires.

M. Mascart recently illustrated by experiments before the French Philosophical Society the possible dangers of fire from electric lights. He pointed out the necessity for precaution in electric light installations against excessive heating of the conductors, and the risk of materials being ignited by heat generated in the lamps. In the case of insulated wires laid under mouldings the heat generated was usually dissipated by conduction, which keeps down the temperature of the wire and its covering. An excessive current might destroy the insulation and inflame the wood. An experiment was made with a wire 1·2 mm. diameter, laid between two blocks of wood. This wire would in ordinary practice carry a current of 4 amperes, but in this experiment the current was increased to 40 amperes, at which point carbonization of the wood began. With a greater current the wood was ignited. To test the danger from lamps, the following eight experiments were made: 1. The globe of an arc lamp was covered with several thicknesses of a light fabric, such as green tarlatan. 2. A glow lamp of 32 candle power was covered in a similar manner, the folds of the cloth being held against the lamp by an India rubber band. 3. An incandescent lamp was covered with a cotton hood. 4. A glow lamp was covered with a similar hood of black silk, which was surrounded by another of velvet. 5. A lamp was covered with a layer of white wadding, the gummed surface of which had been removed. 6. Two glow lamps were covered with layers of wadding, one layer white, the other black. 7. A lamp of 32 candle power was placed in a vertical fold of an old theatrical scene. 8. A lamp of 300 candle power was laid in a similar scene. In cases 1, 2, 5, and 7 no carbonization nor excessive heating was caused for 20 minutes. In case 8 the scene commenced to carbonize without flame after 1½ minutes. At the end of 2 minutes the envelope of the lamps in 5 burst into flame, and in 6 minutes the velvet calotte in experiment 4 commenced to burn slowly. The cotton hood in 3 was partially carbonized at the end of 10 minutes, but was not set on fire.

Soap from Mount Carmel.

The manufacturers are members of a religious community called the "Temple Society." This society originated in Germany some twenty-five years ago; their first object being to protest against the rationalistic views of Dr. Strauss and his school. They have very strict rules of living, and hold strong views as to the early second advent of the Messiah. A section of them (mostly Germans) established themselves at the foot of Mount Carmel about the year 1868, and set to work to introduce Western ideas by colonizing methods. They fixed upon a spot about a mile to the west of the ancient town of Haifa, between Mount Carmel and the sea, as their headquarters, and they have made this locality quite a little center of order and industry. For a long time the native inhabitants were suspicious and jealous; but their straightforward way of paying honorably for all work done for them has to a great extent won the confidence of the Arabs, whose respect has been more recently developed by a good road, 22 miles in length, from Haifa to Nazareth, which the colonists constructed at a cost of about 200*l*. What is generally called Mount Carmel is in fact a small range of high land 13 miles long and about 9 miles wide. It consists of plains and caves, and, like the rest of the Holy Land, gives evidence of ancient towns, strongholds, and tombs. The scenery in many parts is very fine. Close by is the plain of Kishon and the famous well for which Saladin and Richard Cœur de Lion fought so vigorously.

Vaccination in the Harem.

The women in the Sultan's seraglio, at Constantinople, have just been vaccinated, to the number of 150. The operation took place in a large hall, under the superintendence of four gigantic eunuchs. The Italian surgeon to whom the task was confided was stationed in front of a huge screen, and the women were concealed behind it. A hole had been made in the center of the screen, just large enough to allow an arm to pass through; and in this manner the arms, of various colors and sizes, were presented to the operator in rapid succession. It was utterly impossible for the surgeon to get a glimpse of his patients; but, in order to guard against the chance of his being able to see through the screen, two eunuchs, who stood by the operator, threw a shawl over his face the instant an operation was concluded, and did not remove it till the next arm had been placed in position.—*Indian Medical Gazette.*

Softening and Purifying Water.

G. E. Davis, of Manchester, has a method of using tribasic phosphate of soda, which softens the water, and leaves a useful phosphate of lime as a manure. Most natural waters contain lime or other substances which render them unfit for use for trade purposes and inconvenient for domestic use. River water, or brook water, or rain water is, of course, an exception, and it is the object of this invention to eliminate most of the lime and other interfering substances, so that well water, or water containing lime and other substances, may be used for domestic or trade purposes with almost the same ease as the water from rivers or brooks, or rain water. In carrying out the invention the patentee adds to the water to be treated tribasic phosphate of soda, preferably in a state of solution in water, and mixes it with the water undergoing treatment until the one is well incorporated with the other. The mixture made is then allowed to settle, whereupon the lime salts fall to the bottom of the vessel, mixed with other substances, and the clear water may be drawn off for use, or be pumped away into a store tank. The residue remaining in the tank or other vessel may be used as a manure, as it contains a large quantity of phosphate of lime. The quantity of tribasic phosphate of soda required will vary with the hardness of each water to be treated, but a good guide for the proportion required to each gallon of the water will be five times the amount in grains of the hardness of the water by Clark's scale of crystallized tribasic phosphate of soda—that is to say, a water of 10° of hardness would require about fifty grains of tribasic phosphate of soda per gallon; but where the hardness is of the quality called "permanent hardness," about one-half of this quantity only is necessary, or even less than that.

A Sea-going Dredger.

The members of the Engineering Society of University College, Bristol, recently spent a day on a new dredger which has been built by Messrs. Simons & Co., of Renfrew, and respecting which the secretary of the society sends us the following particulars. The dredger, which is of steel, was constructed to the plans of Mr. Girdlestone, the engineer of the Bristol Docks. It is 225 ft. long and 45 ft. broad, and draws 14 ft. 6 in. when fully laden. The dredging is performed in the usual way by buckets having a capacity of 1 ton; these revolve round tumblers, which are worked by the same engines which propel the vessel when she is under way. The buckets combined deliver from 17 tons to 19 tons per minute. The hopper capacity is from 1,000 tons to 1,200 tons, mainly depending on the nature of the dredgings. When the vessel is fully laden, the bucket ladder is raised by a crane at the stern. The vessel then steams out to sea at a speed of about ten knots an hour. The propulsion is effected by two triple expansion engines of 1,600 I.H.P. Each of the engines works a screw fore and aft. Thus there are four screws altogether, each having a diameter of 8 ft. 2 in. The process of discharging the material is very speedy. The vessel may be going along at nine knots, when on a given signal the engines slow down, and the whole 1,000 tons of spoil are discharged in the space of a minute. The doors can be drawn up and the dredger steaming back again at full speed in eight minutes from the first signal. The four screws enable her to travel ahead or astern with equal facility, and to turn in her own length when required. Thus while all large craft are obliged to make use of tugs to navigate the very sinuous course of the Avon, the dredger is independent of all extraneous aid.

How to Make Ground Glass.

Breaking the ground glass is an accident not very easily remedied in a small country village where one cannot be procured. I propose to tell the readers of the SCIENTIFIC AMERICAN how I made one.

I first bought five cents' worth of emery and two plates of glass the size required. Spoiled negatives will answer if they are cleaned, which can be done with a strong solution of lye. I placed one of the glasses on a flat board and sprinkled a small quantity of the emery on it, which I wet with water. Placing the other glass on that, I ground them together, renewing the emery and water whenever necessary. In about one hour I had two of the finest quality of ground glass, fully as good as those I would have to pay seventy-five cents for (8 by 10 size).

The emery may be carried by the amateur much easier than an extra ground glass. AMATEUR.

AN experiment, which is looked upon as a success, was recently made on the Shropshire Union Canal, at Worleston, by the officials of the London & North-Western Railway. A set of rails, of 18 in. gauge, was laid down on the bank of the canal for a distance of a mile, and a small locomotive from the Crewe Railway Works drew along easily, at the rate of seven miles an hour, two boats by means of ropes. The size and weight of the boats is not given. How many cars and how much freight the locomotive could draw on the track is not stated.

A Paper Organ.

A very original musical instrument has recently been constructed at Milan—an organ whose pipes, instead of being of metal, are of paper pulp. Its history is quite curious. Father Giovanni Crispi Rigghizo, having learned that the parish dell'Incoranata, at Milan, was destitute of music for the offices, conceived the idea of devising a cheap material that would permit of constructing organs under such conditions that the most unpretending communities could purchase one of these instruments. This monk, who had passed his life in poverty, was confronted by lack of money, and, notwithstanding his efforts to carry out his undertaking, was beginning to despair of success, when he had the fortune to meet an artisan, Luigi Colombo, who understood the construction of the instrument, and was good enough to aid him in carrying out his design. They both went resolutely to work, and, finally, in June, 1886, finished the instrument in question. Unfortunately, by reason of lack of funds, they could not exceed 22 registers, 44 pedals, and 1,400 pipes. The final result, however, is extremely interesting, since it is generally agreed that the instrument possesses great power, and a sweetness of tone not found in organs hitherto constructed.—*La Science en Famille.*

"SPIRAL" GARDEN HOSE.

The "Spiral" garden hose, a cut of which is shown herewith, is designed to resist the deteriorating influences of moisture. It may be soaked every time it is used, but, having no outside covering to imprison the moisture, dries quickly. The cotton is uninjured, and will last for years. This fact is well known by fire departments, where rubber-lined cotton hose has been known to last for over twenty years. This hose is manufactured by the Boston Woven Hose Company, of 230 Devonshire Street, Boston, Mass. This company also manufactures the "Cowen" steam hose. This hose is being largely used by the fire departments, and

"SPIRAL" GARDEN HOSE.

gives excellent satisfaction. It will stand a pressure of 1,500 pounds, depending for its strength to resist a bursting pressure upon the cotton jackets, which are woven with heavy filling threads running spirally the whole length of the hose. It has a much longer life than the ordinary steam hose, for when it gets used to the point where the rubber hose is before being used, it will then have lasted as long as the ordinary rubber steam hose.

The French Torpedo Boat Coureur.

A new first class torpedo boat has just been completed by Messrs. Thornycroft & Co., London, for the French government, and was launched June 13. This vessel, which is named the Coureur, is a twin screw boat, and sister ship to the Ariete, which was built by this firm for the Spanish government last year, and which attained on the official measured mile trial on the Thames, with a load of 17·35 tons on board, the remarkable speed of 26¼ knots or more than 30 miles per hour. The dimensions of the Coureur are: Length, 147 feet 6 inches; beam, 14 feet 6 inches; draught (loaded), 5 feet. The hull is constructed of galvanized steel throughout, and is divided into numerous watertight compartments, which are fitted with steam ejectors for keeping them clear of water in the event of shell being damaged by collision or shot holes. Any two of the compartments can be filled without sinking the boat.

The engines are of the usual direct-acting compound surface-condensing type made by Messrs. Thornycroft, the indicated horse power at full speed being about 1,550 collectively, divided pretty equally between the two pairs of engines. The arrangement of the machinery gives roomy engine space, a very satisfactory feature in a torpedo boat. The boilers fitted in the Coureur (two in number) are on Thornycroft's tubulous system, by means of which steam can be supplied at pressures up to 200 lb. per square inch with an immunity from leakage and priming which is not considered possible to secure in boilers of the ordinary type. This new boiler is lighter in weight, and takes up less length in the boat, than those of the locomotive type, and it has so far proved so thoroughly efficient that Messrs. Thornycroft are now fitting it in all their torpedo boats.

Another important improvement is the excellent maneuvering powers obtained by the use of Thornycroft's patent double rudders, which are placed one on each side of the propellers. The torpedo armament consists of two tubes built in the bow of the boat, for discharging Whitehead torpedoes by means of gunpowder impulse. The gun armament is an important feature in the Coureur, which carries four 1·85 inch Hotchkiss guns, two fixed on the conning towers, and two being carried on the deck for firing broadside. The vessel is fitted with masts and sails, a Normandy fresh water condenser, and all the latest improvements, including an electric light installation for lighting the interior of the boat.

We should like to know the reason why our navy department does not supply itself with some boats of this sort.

The Folly of Haste to be Rich.

Chancellor Howard Crosby, one of the best preachers and best thinkers in New York City, has an article in the *Forum* for May, in which he says:

"The greatest need of our land to-day is an education away from the fearful danger of a haste to be rich, a cultivation of the quiet and improving arts, an encouragement of genial and benevolent lives, a preservation of home virtues, a teaching of the truth that moderation best serves the cause of happiness, and a demonstration that in helpfulness to others, man best helps himself.

"While wise laws can do much to suppress some of the worst features of the gold hunt, it is to the press, the school, and the church that we must look for the inculcation of the purer and loftier ideas that will meet and overcome the materialism which the peculiar conditions of our country have fostered, and which the thoughtless minds of our youths so readily accept." Contented minds are more conducive to happiness than riches, glory, or fame. In our life work let us remember that it will profit us but little if we gain a world of wealth and lose contentment and happiness.

Effect of Ammonia on Animal Life.

An explosion of an ammonia tank occurred May 6, at the Buckeye Brewery, with a very strange result. Almost immediately after the explosion every bird in the neighborhood fell dead. Chippies, English sparrows, and canaries all suffered alike, and after the shock dead birds could be seen lying about the sidewalks in that locality in great numbers. The explosion caused an alarm of fire to be sent in, and the horse attached to the hose reel No. 5, which responded, came near being killed by the ammonia. The animal dashed toward the supposed fire with all the speed he possessed, but when the strong odor of the ammonia struck his nostrils he was completely overcome and could not move. The horse was at once withdrawn from the place and restoratives applied. John Loder, George Kotts, laborers, and Fireman Ross were in the room at the time, but escaped uninjured. Besides the injury done to the tank, the company will lose $500, the value of the ammonia.—*Cincinnati Enquirer.*

An Elevator Air Cushion.

A test of the Ellithorpe air cushion for elevators was made recently in a New York dry goods house. One of the largest Otis elevators, weighing 2,300 pounds, equipped with plate glass mirrors and fragile electric light globes, and loaded with baskets of eggs and with glassware filled with water, was cut loose from the top floor and allowed to fall to the bottom of the shaft. It shot down eighty feet in about three seconds. The "cushion," which stands seventeen and one-half feet high from the bottom of the shaft, and is constructed of wood and glass so as to be air tight, received the elevator with so little shock that not even an egg was broken nor a drop of water spilled. The test was considered a complete success. The force of the compressed air of the "cushion" gently pushed the elevator up again about four inches, when it descended again to its place without jar. The force of the descent was estimated at the top of the "cushion" as indicating 60,000 pounds.

Florida to Produce Opium.

The *Medical Bulletin* says that "Florida promises to become a large producer of opium. The poppy grows there very readily, and larger than anywhere else in the United States. Sixteen plants will produce an ounce of opium, and an acre should give a profit of a thousand dollars. As the plants will thrive among trees, the land on which are young and non-bearing orange orchards can be utilized while the trees are reaching maturity." The fact should be recognized, however, that the poppy, like all plants containing numerous alkaloids or highly complex compounds, tends to exhaust the soil, and hence the present proposed experiment of planting poppies among immature orange trees will probably fail. Either the oranges or the poppies will be deficient in quality or in quantity.

THE *Electrical Review* says that the uselessness of the lightning rod is becoming so generally understood that the agents find their vocation a trying one. Fewer and fewer rods are manufactured each year, and the day will come when a lightning rod on a house will be regarded in the same light as a horseshoe over a man's door.

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Robert Wilson, of Grubville, Mo. This invention covers a novel combination and arrangement of parts in a coupler designed to be automatic in operation, and which can be used with the ordinary form of link if desired.

A steam boiler has been patented by Mr. Mortimer S. Rexford, of Norman, Dakota. It is a twin cylindrical boiler, with one cylinder above the other and connected by circulating pipes at the sides, and having the grate and fire chamber between them, being designed to occupy but little room, have a large fire space, and also include the advantages of a feed water heater.

A danger signal for bridges has been patented by Mr. Milon O. Godding, of Monrovia, Cal. The invention covers novel tripping devices combined with a falling signal, and also means for exploding a cartridge, to permit the signal to be made known in the night time, to notify a moving train of the burning of a bridge or the destruction of the roadbed by a washout or snow slide, etc.

A railway rail crossing has been pa- tented by Mr. James Rice, of Prairie Creek, Ind. It is intended to take the place of the stock guard ordinarily employed, being of simple construction and designed to normally lie flat between the tracks and at their sides, so that cars may pass without interruption, while it will effectually prevent stock from escaping up or down the track.

AGRICULTURAL INVENTIONS.

A grain adjuster for binders has been patented by Mr. Frederick E. R. Malke, of Christney, Ind. It is an appliance for evening up grain delivered to the binding table of a harvesting machine, and the invention covers novel features in its construction and the arrangement of parts.

A mower has been patented by Mr. Albert L. Quillium, of Chateaugay, N. Y. This invention covers an improvement in mowers, having two cutter bars which reciprocate in opposite directions simultaneously, and is designed to afford a construction of machine calculated to work perfectly in the field and be of very light draught.

A bran remover has been patented by Mr. George W. H. Safely, of New Orleans, La. It is for removing the bran from rice and other grain after hulling, there being a shaft journaled vertically in a vessel containing the grain, in connection with a screw having threads downwardly inclined, whereby the grain is carried rapidly downward and such circulation is secured as to remove the bran.

A plow has been patented by Mr. Thomas A. Blanchard, of Appling, Ga. It is so constructed as to facilitate the vertical adjustment of the plow mouldboard and sweeps relatively to the plow beam, to regulate the depth at which the plow shall work in the ground, and provides for setting the sweeps at different angles to the line of draught and for adjusting their faces at varying vertical resistances to the soil, while the handles may be easily adjusted to the height of the plowman.

MISCELLANEOUS INVENTIONS.

An improvement in suspenders has been patented by Mr. Jacob Katzenberg, of New York City. All buckles and metal pieces at the front, which soil and wear the shirt, are dispensed with, and the metal at the back is reduced to a minimum, the straps being adjusted as to length by buckles at the back.

A pump has been patented by Mr. John B. Drake, of Goshen, Ind. A crank arm is pivotally connected with the pitman carrying the plunger, a shaft turning in the pump head carrying the crank arm, while an arm secured to the outer end of the shaft has three crank pins, one adapted to be connected with the windmill rod, a pump handle being secured to the other two.

A burglar alarm has been patented by Messrs. Scott C. Freeman and John B. Soward, of Nevada, Mo. The invention consists of a novel construction and combination of parts whereby, when a window or door attached to the device is opened, a bell or bells will be caused to ring until stopped by an inmate of the house, or until the power of the device is exhausted.

A feathering paddle wheel has been patented by Mr. Robert J. Jones, of Carrollton, Washington Ter. It is designed to be operated the full depth of the vessel, and to avoid loss of power and steam by being thrown out of the water when the vessel lurches in a rough sea, the invention covering various novel features of construction and the combination of parts.

A truck has been patented by Messrs. William J. Kennedy and Louis A. De Mayo, of Jersey City, N. J. The invention consists in the novel construction of the standards adapted to receive the carrier, and in the peculiar bearings of the carrier, so that the load may be easily and quickly dumped without removing the carrier, or the carrier may be readily detached from the truck.

A ship's log has been patented by Mr. Eugene E. Haskell, of Forestville, N. Y. It is an instrument to be suspended by a cable and carrying a propeller wheel, whose revolutions, according to the rate of progress through the water, will make and break electric contacts, which will be recorded on a register to indicate the number of revolutions per minute, whereby the speed of a vessel may be determined.

A wheel has been patented by Mr. Austin J. Hanks, of Wilmington, Ohio. This invention relates to improvements in what are known as "suspension wheels," and the hub is made up of two pairs of disks, the inner disks being formed with corks, and the outer disks with ribs or flanges to serve as supports for the corks, with other novel features, making a wheel especially designed for tricycles, and adapted for use with any light vehicle.

A running gear for vehicles has been patented by Mr. Alfred W. Johnson, of New Brunswick, N. J. This invention covers devices whereby both the front and rear axles are fitted to swivel or turn centrally of their length, whereby greater flexibility is given to the vehicle, and the wheels of the two axles are made to skew in common when turning the vehicle, the axles carrying the wheels simultaneously swiveling in opposite directions.

A road cart has been patented by Mr. Wilber M. McCrossen, of West Branch, Mich. The axle is dropped centrally, and the body supported through springs on the dropped portion, while the thills are fitted at their rear end loosely on the axle, and to the thills, adjacent to the front end of the body, are secured front springs incased in barrels depending from the thills, with other novel features, making a cart easy to get into and out of, and which is designed to be easy riding and free of horse motion.

A valve mechanism for sewerage sys- tems forms the subject of two patents issued to Mr. Charles H. Shepherd, of New York City. These inventions cover improvements on a former patented invention of the same inventor, one being designed to provide devices for retarding the closing of the valve at the end of the sewage pipe, to give the contents of the pipe time to escape before the valve closes, and the other providing mechanism by which the discharge valve of the sewage pipe may be opened or closed, and by which the valve may be held securely in a partly open position in case anything should become lodged between the valve and its seat.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

NEW BOOKS AND PUBLICATIONS.

PHÉNOMÈNES ELECTRIQUES DE L'ATMOSPHERE. By Gaston P. Planté. Paris. J. B. Ballière et Fils. 1888. Pp. 323.

In this attractively printed and well illustrated volume are contained descriptions of many phenomena of atmospheric electricity. Lightning strokes and allied manifestations are fully discussed, and their nature elucidated by comparison with the phenomena of high tension currents. These experiments performed with the intense and high voltage currents produced by storage batteries are already a classic of the science.

A map of the United States, 40 by 60 inches, mounted on rollers, and very convenient for office use, has been published by Messrs. Levick & Levick, of No. 15 State Street, New York City. On its reverse side is a large county map of the Pacific States and of Mexico.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) B. S. B. (Col.) desires a recipe for making good cider from boiled cider. We can get the boiled or condensed cider here, but it is hard to get apples in this country. A. We cannot. Boiled cider, in our experience, is used chiefly for cooking purposes. The following makes somewhat of a substitute for cider. Water 1 gallon, common sugar 1 pound, tartaric acid ½ ounce, yeast 1 tablespoonful; shake well, make in the evening, keep cool, and it will be fit to use next day.

(2) I. H. F. writes to F. B. P. (39), who inquires for a remedy for removal of warts. With a match or similar small stick, apply several times strong nitric acid to the center of wart, which can easily be done in such manner as to avoid touching the tender skin around the wart. Let dry, and after a day or two repeat the operation, after which the wart will disappear. Should the acid reach tender point, through the wart, cease the application and at once apply a stream of cold water. I have succeeded with this several times.

(3) C. W. D. writes: Our fishermen in Lake Erie fish in water 500 ft. deep, and on their nets use floats of white cedar about 3¼ in. and 1¾ in. diameter, with a ¾ in. hole through the center. These floats soon get water-soaked at that great depth, and are useless. How can that best be prevented, so that they will retain their buoyancy? A. We suggest boiling the floats in paraffine.

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Proposals for Steel for Use in the Construction of the United States Armored Battle Ship "Texas" at the Navy Yard, Portsmouth, Virginia.—NAVY DEPARTMENT, WASHINGTON, D. C., *June 21, 1888.*—Under authority conferred by an act of Congress, entitled "An act to increase the naval establishment," approved August 3, 1886 (24 Statutes at Large, page 215), sealed proposals are hereby invited, and will be received at this Department until 12 o'clock noon on Monday, the 23d day of July, 1888 for furnishing the following classes of material for use in the construction of said ship: CLASS A.—*Steel plates.*—About nine hundred and twenty (920) tons of steel plates from 2½ to 25 pounds per square foot. CLASS B.—*Steel shapes.*—About five hundred and three (503) tons of steel shapes, as follows: About two hundred and seventy (270) tons of angle-bars of various sizes; about one hundred and thirty-two (132) tons of angle and T-bulb beams, with proper curvature, from 11 to 24½ pounds per lineal foot; about ten (10) tons of T-bars, of 8 pounds per lineal foot; about ninety-one (91) tons of channel-bars, of 10, 15, and 25 pounds per lineal foot. CLASS C.—*Steel rivets.*—About one hundred (100) tons of steel rivets from ⅝ inch to 1¼ inch diameter. CLASS D.—*Steel castings.*—About one hundred and twenty (120) tons of steel castings, of various shapes, including stem, stern-post, hawse-pipes, riding and mooring bitts, chain-pipes, etc. The tons of material herein called for to be of 2,240 pounds each. All said material to be of such detailed dimensions, weights, and shapes as may be required in the construction of the vessel, and to be delivered at such place or places in the Navy Yard, Portsmouth, Virginia, as may be designated by the Commandant of said Yard. Deliveries to commence within thirty (30) days from the date of contract, and to be completed within six (6) months from such date; the material to be delivered promptly, in accordance with a detailed schedule prepared by the Assistant Naval Constructor at said Navy Yard, and in the order required to carry on the work to the best interests of the Government. All material to be of domestic manufacture, and to be accepted only after passing such tests as may be prescribed therefor by the Secretary of the Navy. Proposals must be in accordance with forms which will be furnished on application to the Bureau of Construction and Repair, and may be for one or more of the classes designated, but no bid for a portion of any class will be considered. Each proposal must be accompanied by satisfactory evidence that the bidder is able to furnish and deliver the material for which he bids. Each proposal must be accompanied by a certified check payable to the order of the Secretary of the Navy, for an amount equal to five per cent. of the bid. The check received from the successful bidder will be returned to him on his entering into a formal contract for the due performance of the work, and giving bond for the same, with satisfactory surety, in a penal sum equal to twenty-five per cent. of the amount of his bid; but in case he shall fail to enter into such contract and to give such bond within twenty days after notice of the acceptance of his proposal, the check accompanying such proposal shall become the property of the United States. All checks accompanying proposals which are not accepted will be returned immediately after the award shall have been made. Information relative to the dimensions and shapes of material, and all other information essential to bidders, will be furnished on personal application to the Bureau of Construction and Repair, Navy Department. Proposals must be made in duplicate, and inclosed in envelopes marked "Proposals for Steel for the Armored Battleship 'Texas,'" and addressed to the Secretary of the Navy, Navy Department, Washington, D. C. Each class of materials will be bid for separately, and the Secretary of the Navy reserves the right to reject any or all bids or the bids on any class or classes, as, in his judgment, the interests of the Government may require.

D. B. HARMONY, *Acting Secretary of the Navy.*

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